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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:

ELECTRO-PLATERS REVIEW

A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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Vol. 16 NEW YORK, MAY, 1918. No. 5

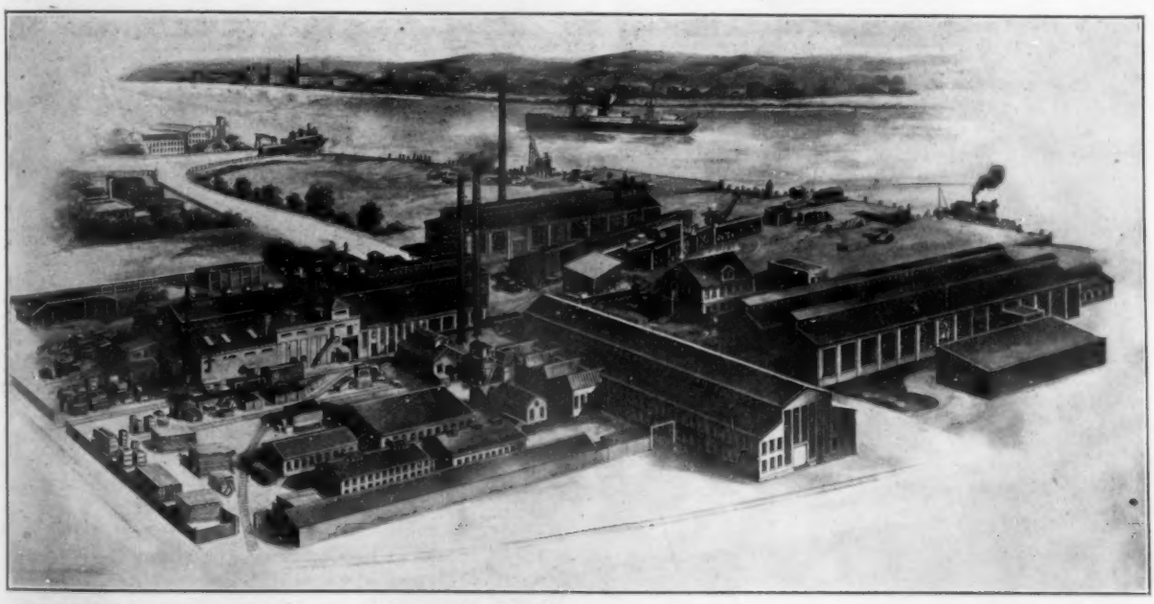
THE WAR AND CONDENSER TUBES

A Brief Description of How These Most Essential Metal Parts of a Warship Are Made at the Plant of the Wheeler Condenser and Engineering Company at Carteret, N. J.

Written for The Metal Industry by J. J. Brown, General Manager.

A warship or any other kind of a ship where steam is the method of propulsion must have a condenser. A condenser must have tubes and these tubes must be of a material and workmanship calculated to withstand the attacks of all sorts of water on one side and the corrosive action of steam on the other. The material that has been found to give the most enduring results for these condenser tubes is made up of copper and zinc with sometimes a little tin. The conditions under which the tubes in a condenser must work are so strenuous that only a combination of the best of virgin metals, the most careful attention in melting and the most skillful manipulation will produce the tubes that will be satisfactory.

The Wheeler Condenser and Engineering Company, of Carteret, N. J., after years spent in the manufacture of condensers, came to the conclusion that if they wanted condenser tubes the quality of which would be at all times up to their self-imposed standard of excellence they would have to make them themselves. The plant shown in our pictures is the result of this decision. Only a little over a year ago was this plant decided upon and now it is, as seen here, in full swing. Figure 1 shows a general bird's-eye view of the whole plant, which includes not only the brass casting shop and tube mill, but also an extensive iron foundry and engine and condenser building shop. Figure 2 shows the portion of the plant with which this article is mainly concerned. Figure 3 gives an outside of the brass casting shop, while Figure 4 exhibits the interior of the tube mill.



BIRDSEYE VIEW OF THE PLANT OF THE WHEELER CONDENSER AND ENGINEERING COMPANY AT CARTERET, N. J.

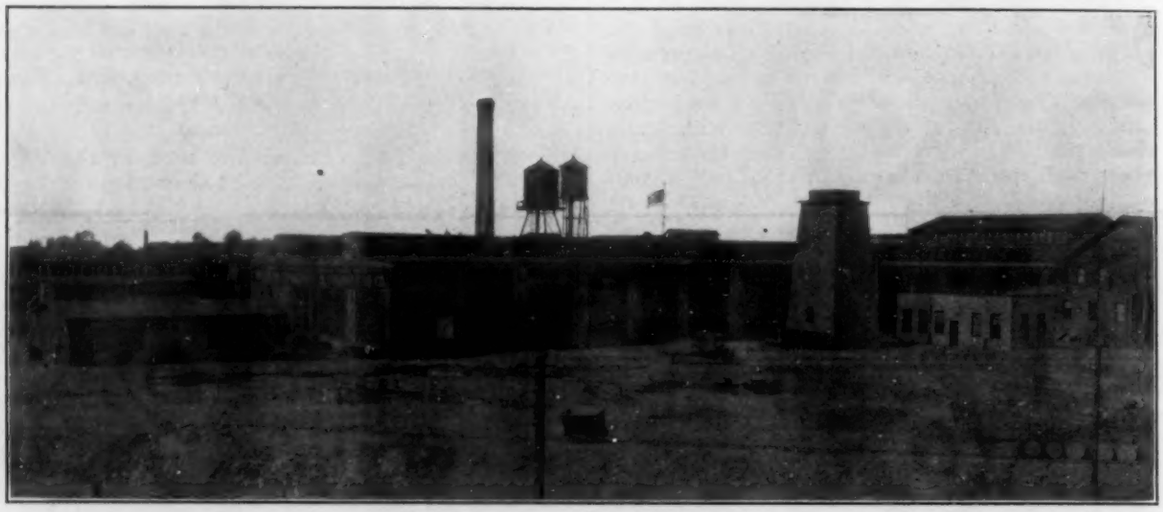
MATERIALS USED

Only the best of materials are used by the Wheeler Company for the manufacture of their tubes. The mixtures used are three in number and are: first, Muntz metal, one of the best known and most widely used for condenser tubing and which contains sixty parts of copper and forty of zinc. Second, the mixture known as "seventy and thirty brass," which contains, as indicated, seventy parts of copper and thirty of zinc, and third, Admiralty mixture, which is seventy parts of copper, twenty-nine of zinc and one of tin. The copper used is the electrolytic refined, a typical analysis of which is as follows:

	Per Cent.
Copper	99.93000

	Per Cent.
Silver	0.00100
Gold	0.00001
Sulphur	0.00300
Oxygen	0,04000
Iron	0.00350
Nickel	0.00400
Arsenic	0.00200
Antimony	0.00300
Aluminum	0.00100
Phosphorus	trace
Lead	0.00200
Bismuth	trace
Selenium	0.00050
Tellurium	0.00050
	99.99051

The specifications for refined electrolytic copper call for not less than 99.88 per cent. copper and the routine test of copper used in the Wheeler foundry runs usually 99.9 per cent. Each shipment of copper is checked by tests of specimens.



A VIEW OF THE WHEELER CONDENSER AND ENGINEERING COMPANY'S TUBE MILL AND BRASS CASTING SHOP, CARTERET, N. J.

Spelter. The spelter or zinc used by the Wheeler Company is that sold in the market under the name of "Grasselli Special" and which corresponds to the grade of intermediate as established by the American Society of Testing Materials. This classification was published in THE METAL INDUSTRY for July, 1915, but for the sake of comparison I will repeat the analysis of high grade and intermediate here.

(a) High grade shall not contain over
0.07 per cent. lead
0.03 " " iron
0.05 " " cadmium

It shall be free from aluminum. The sum of lead, iron and cadmium shall not exceed 0.10 per cent.

(b) Intermediate shall not contain over
0.20 per cent. lead
0.03 " " iron
0.50 " " cadmium.

It shall be free from aluminum. The sum of lead, iron and cadmium shall not exceed 0.50 per cent.

The Grasselli Special, it is stated, runs very close to the "High Grade," as shown by the typical analysis of a recent shipment which showed 0.11 per cent. lead and 0.03 per cent. iron.

Tin—The tin used in the Admiralty mixture tubes is what is called pure Straits and is refined pure tin imported from England. It costs about two cents a pound higher than Banca, which is used for tinning or for various cast brasses and bronzes. Tin must always be tested for impurities, such as antimony, arsenic, copper and lead. The total impurities should not run more than 0.25 per cent.

Scrap—No scrap known as "outside" is used at the Wheeler foundry. Only trimmings, etc., from the tube mill, whose composition is definitely known from analysis are used.

CASTING THE TUBES

The melting and mixing are done in crucibles in pit fires heated with coal. The copper and spelter are weighed out separately and furnished to the caster. For Muntz metal tubes the metal is cast in billets which are about forty inches long and two and a half inches in diameter. Four of these billets are poured from a crucible, and the castings or billets are afterward turned off in a lathe and the ends trimmed back for shrinkage. The billets are then thoroughly inspected and weighed. The Admiralty and "seventy and thirty brass" tube castings are made in "cannon" molds of iron having destructible cores built up of clay and straw over a perforated iron pipe known as a "core barrel." The tubes or shells made in this manner are about four feet long, three and thirteen-sixteenth inches outside diameter and two and five-eighths inches inside diameter, thus making the metal about five-eighths of an inch thick. After the tubes are cast they are cleaned from their cores, the shrinkage ends cut off and then are carefully inspected and weighed.

PIERCING, BREAKING DOWN AND DRAWING

The billets and tubes are now ready to be made into tubes. There are three distinct mechanical processes involved in this procedure. The first of these processes is that applied to the billets, and is known as "piercing." The billet is first heated to a cherry red and then passed through the piercing machine. In this machine the billet is rapidly revolved between conical rollers, while a mandrel is forced through the center of the billet, making a tube. The metal is thus worked at the same

time. After the billets have been formed into rough tubes they pass to the second and third stages of operation, known as "breaking down" and "drawing." These operations are performed on hydraulic draw benches for breaking down, and on chain draw benches for drawing. These machines are too well known to need description here, they can be seen in Fig. 4. The Admiralty and "seventy and thirty brass" tubes are put first on the "breaking down" benches and finally finished to size by successful "drawings" on the smaller and less powerful "draw benches."

ANNEALING AND WHAT IT IS

Between each drawing or set of drawings and after the final drawing, the tubes are annealed. Annealing is necessary in order to soften the metal to permit of the next drawing and to remove all strains between the molecules. The final annealing is necessary to give the finished tubes the proper crystalline structure for use as condenser tubes.

Changes in the toughness, hardness, ductility, resistance to corrosion and other properties of metals resulting from suitable heat treatment or annealing, while remarkable, are no more so than other changes in matter with which we are perhaps more familiar, such as the condensation of steam to water, or the freezing of water into ice. These physical changes take place without change in the chemical constituents of the substance.

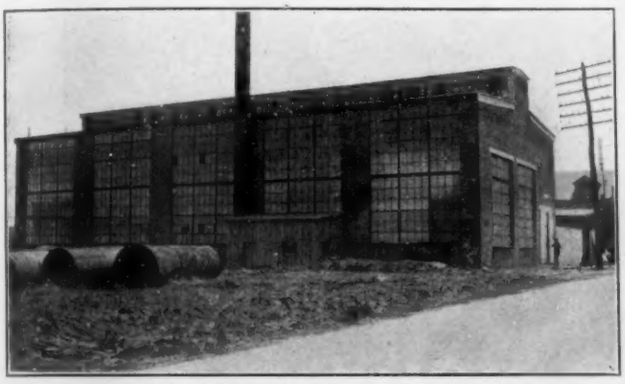
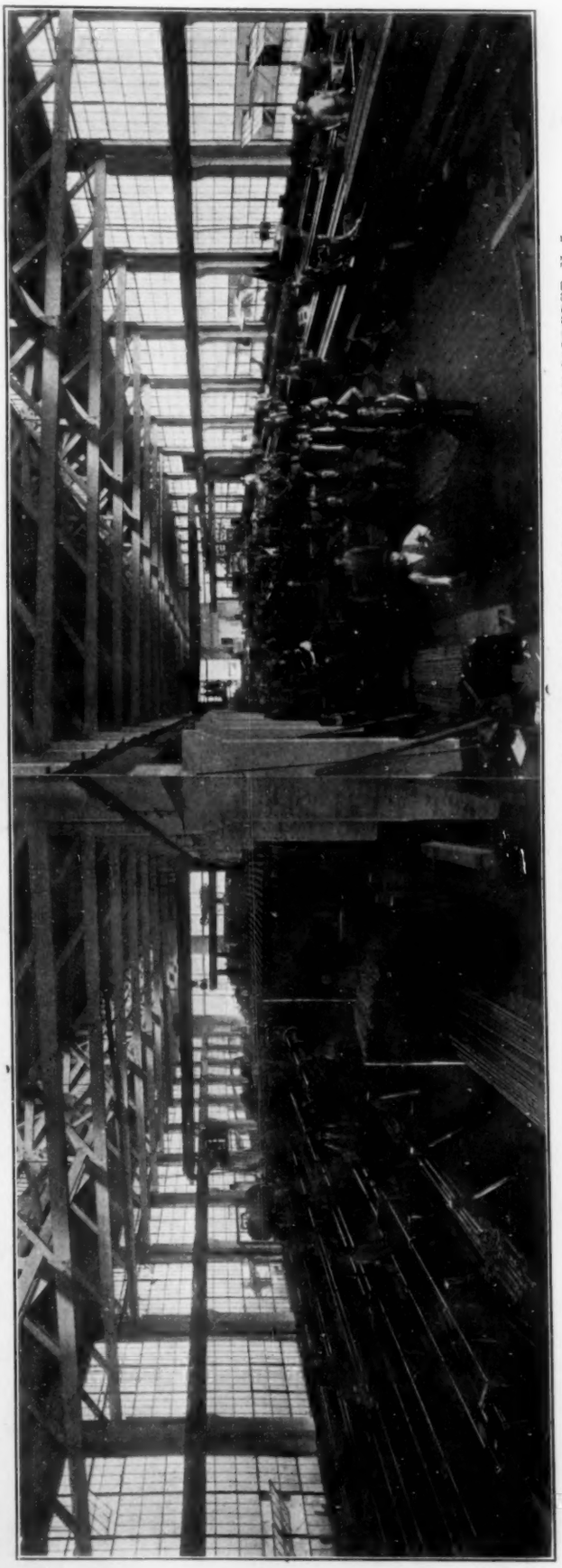


FIG. 3—THE EXTERIOR OF THE CASTING SHOP.

Similarly, metals undergo physical changes with temperature without chemical change. This means that the purity of the metals and their constituents, in the alloy, do not entirely determine the physical properties of the metal. In fact, the annealing is often more important than the chemical composition. Carbon steel properly heat treated is in many cases superior in physical properties to a fancy alloy steel with improper heat treatment.

The general appearance of metals is not changed by annealing, but changes in the structure of the material—in the grain—can be detected, studied and classified by microscopic examination of properly etched sections. It is found that the metal is built up of crystals, whose size, shape and arrangement are an index of hardness or other qualities of metal. The microscope is therefore just as important for proper control of annealing as a vacuum gauge for proper operation of a condenser.

Drawing or other cold working of the metal is found to change the crystalline nature, in general making it finer. It used to be supposed that when metal was drawn it changed in shape like a piece of putty or pitch. This, however, is not the case. It has been demonstrated that the deformation of metals under strain is accompanied by slipping along gliding surfaces of the numerous



INTERIOR OF THE SEAMLESS TUBE MILL OF THE WHEELER CONDENSER AND ENGINEERING COMPANY AT CARTERET, N. J.

crystals contained in the whole mass. This is also accompanied by reduction in the size of the crystals, and it is supposed that the increased hardness is due to the fine crystalline structure. More elaborate theories are proposed, but these need not be considered here. The fact is, that drawing hardens the metal, this being termed strain hardening.

A certain amount of cold drawing is desirable, as it kneads the metal and produces better interlocking of the grains. But after a certain amount of cold working which may be one or more drawings, depending on the degree of pinching at each draw, it is necessary to anneal, in order to recrystallize and remove the distortion caused by the strain. The temperature and time of annealing must not be so great as to cause rapid growth in crystals because this will result in coarse crystals and loss of elastic strength. This precaution is particularly important after the final drawing. The metal must be annealed just enough to remove strains and distortion of crystals and still preserve an even fine grain.

The factors influencing annealing are:

The temperature of the furnace.
Time of annealing.
Size of charge.
Thickness of the tube.
Nature of the alloy.

The alloy and thickness of the tubes vary, and it is necessary that the size of charge, time of annealing and temperature be properly regulated to give correct annealing conditions. Within limits, a longer time of annealing at lower temperature is equivalent to a shorter time at higher temperature, and vice versa.

Annealing is done in large rectangular furnaces called "annealing muffles." These furnaces are built of fire brick, heated with oil and open at both ends. The tubes are drawn in at one end and maintained at certain temperatures for fixed periods, and then withdrawn at the other end to cool in the air or to be quenched. The temperatures found to be correct for the various mixtures at the Wheeler plant are

Muntz metal.....	875-950 Degrees Fahr.
Admiralty.....	1,450 Degrees Fahr.
Copper.....	1,500 Degrees Fahr.

After the tubes have been annealed they are covered with a scale due to the oxidation of the copper. This scale must be removed before the next drawing operations are carried out. The tubes are therefore "pickled," that is, they are picked up in bundles and immersed in a solution of ten parts of water and one of sulphuric acid contained in lead lined tanks. This solution dissolves off the copper oxide scale leaving the surface of the tube clean and smooth. After the final draw, annealing and pickling, the tubes are washed and run through a straightening machine, which removes any bends. They are then trimmed to length, and tested under hydraulic pressure, those developing leaks being rejected.

(French Official. Committee on Public Information.)

A MESSAGE TO THE GERMANS.

Women in the munition plants throughout France are turning out millions and millions of cartridges which will be sent to the Germans via the Poilus as a message to the invaders that the women of France are backing up their men folk in the fight for freedom. . . . Toulon, France.

ELECTRO-PLATING ENGINEERING

A Series of Articles Relating to the Operations and Equipment Employed in Electro-Plating and the Reasons Therefor—Sixth Paper. This Series Began in The Metal Industry, January, 1916.

Written for The Metal Industry by Charles Blake Willmore.

PROBLEMS IN ELECTRICAL MEASUREMENTS.

Fig. 19, A and B, shows how to connect the instruments to make this determination of resistance. For the highest accuracy use arrangement A to measure low resistance, and arrangement B to measure high resistance.

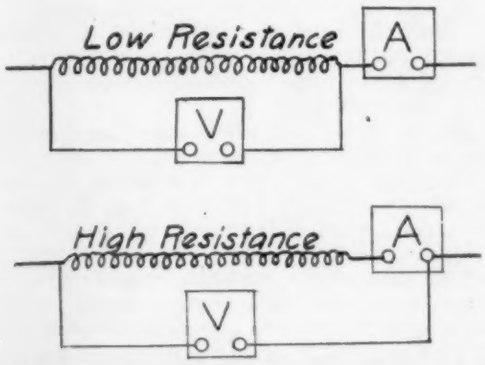


FIG. 19—SHOWING HOW TO CONNECT INSTRUMENTS TO DETERMINE RESISTANCE.

A little study will prove the reason for the differences in the two arrangements shown in these figures. In A the current going through the voltmeter is added to the ammeter reading; but because the resistance is low, the total current is large and the error caused by the voltmeter current is relatively insignificant. But where the resistance is high, the total current is low and the error resulting from the voltmeter current relatively large, so it is shunted around the ammeter, as in B. It will be seen further that the relatively large resistance of the ammeter is not included in the total resistance in A, while the relatively small resistance of the ammeter is included in B.

The power in any circuit is equal to the product of the voltage times the amperage, or $E \times I$, and it is expressed in watts. The loss of power in a conductor carrying a current is likewise equal to the product of the current times the drop in voltage throughout the conductor. Or since E is equal to $I \times R$ by equation (2), then the loss in power is equal to $I \times I \times R$ or I^2R. It is thus seen that the loss in power is not proportional to the current flowing but to the square of the current.

The following problem is often presented to the technical man:

A certain pair of bus bars is already supplying power to tanks, and it is desired to add another tank to the circuit. Will the present bus bars economically transmit the power, or will it pay to install larger bus bars?

Referring to Fig. 20, let this represent a layout of tank connections showing tanks already in use, X marking the spot where the new tank is to be installed. It is assumed in this demonstration that the bus bars are uniform in cross section over their entire length. With ammeter, voltmeter, and rule or tape measure, take the following readings, while the tanks are being used on regular load.

Ia = total amperage, measured at dynamo.
Ea = voltage across bus bars at dynamo.
Eb = voltage across bus bars at first tank in line.
Ec = voltage across bus bars at last tank in line.
La = length of conductors (both bars) to first tank.
Lb = length of conductors between first and last tank.
Lc = length of conductors between last tank and new tank.

Then make the following computations:

$\frac{Ea - Eb}{I}$ = Resistance of conductor to first tank = Ra.

Ra/La = resistance of conductor per foot = r.

Lb × r = resistance of conductor between first and last tank = Rb.

Lc × r = resistance of conductor between last tank and new tank = Rc.

$\frac{Eb - Ec}{Rc}$ = Average current between 1st and last tank = Ib.

Let Ic = current which will be taken by new tank.

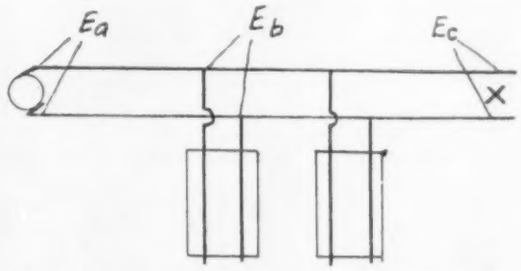


FIG. 20—A LAYOUT OF PLATING TANK CONNECTIONS.

Then the extra loss in power occasioned by the extra current will be equal to:

$$(Ia + Ic)^2 Ra + (Ib + Ic)^2 Rb + (Ic)^2 Rc.$$

This result is in watts. To change it to kilowatt hours per day, divide by 1,000 and multiply by the number of hours in a working day. This, multiplied by the cost per kilowatt hour will give the actual money loss per day. Balance this against the interest on the money necessary to increase the capacity and you can then judge whether or not it will pay to make the change.

The voltage at the new tank under full load will be equal to:

$$Ec - Ic(Ra + Rb + Rc)$$

The resistance of the bus bars may also be calculated by the following formula:

$R = \frac{L \times .0000082}{A}$, where L is the length in feet and A is the cross sectional area in square inches.

Thus a conductor 10 feet long with a diameter of .182 inches has a resistance $= \frac{10 \times .0000082}{(.182)^2 \times .7854} = .00315$ ohms.

HOW ELECTRICAL INSTRUMENTS INDICATE THE CONDITION OF THE SOLUTION.

The behavior of the electrical instruments on a plating tank is one of the quickest indications of the conditions of the solution, and next to actual chemical analysis of the solution, it is the surest indication. To be effective in this respect, however, both ammeter and voltmeter must be used in conjunction; either one alone does not tell half of the story.

In a cyanide solution, some of the things that go together to indicate an overabundance of cyanide, or a lack of metal, are:

A thin plate.

Medium voltage across the tank as shown by voltmeter.

Good current as shown by the ammeter.

When the plate is thin, the trouble is due to one of the following causes: Too much cyanide, too little cyanide, or a poor connection in the power circuit. The showing of proper voltage on the voltmeter eliminates the possibility of a poor connection to the tank, and the fact that there is good current flowing at a moderate voltage eliminates the possibility of there being too little cyanide, as in that case the anodes would coat over and the current would be low and the voltage high. By this process of elimination, therefore, the above set of conditions indicates too much cyanide in the solution.

Another test may be used to check up the above conclusion. This test is possibly a little too scientific for everyday practical use in the plating room, but it should prove of interest to live platers. In this test the indications of too much cyanide are:

Comparatively high voltage at cathode.

Comparatively low voltage at anode.

To obtain the voltage at the anode connect the positive pole of the voltmeter to the anode, and connect the negative pole of the instrument to a sheet of metal of the same composition as the metal being deposited. Insert this sheet of metal in the solution midway between the anode and cathode without allowing it to come in contact with either. This sheet is known as an auxiliary electrode.

To get the voltage at the cathode, attach the auxiliary electrode to the positive pole of the voltmeter and the cathode to the negative pole. Where the voltage is low, it will be of advantage to use an instrument with a fine scale.

The indications of a lack of cyanide in the solution are:

Thin plate.

High voltage.

Small current.

Upon first making the circuit after the tank has been standing idle for a time, the current may be fairly high and the voltage about normal, but the current at once begins to fall off, and rapidly becomes very small, while the voltage quickly rises to about the same as the dynamo. These conditions are caused by the coating over of the anode owing to a lack of cyanide in the bath.

The indications of a lack of cyanide by the auxiliary electrode described above are:

Comparatively low voltage at the cathode.

Comparatively high voltage at the anode.

In a nickel solution the auxiliary electrode may be used to good advantage to ascertain whether or not the anodes are dissolving properly. If the auxiliary electrode shows that there is very much of a voltage between the solution and the anode, it is an indication of poor anode efficiency, and the higher this voltage, the poorer the anode efficiency.

In making all readings with auxiliary electrodes, for the sake of accuracy, the voltmeter lead must be attached directly to the anode rather than to the anode hook.

TRACING OUT CURRENT LEAKAGES

Very large current leakages are not frequent in the plating room; but when they occur they may be traced to one or more of the following causes:

(a) Steel or lead lined tanks with poor insulation between the anode and work rods and the edge of the tank. Placing a wooden cleat between the rods and the metallic edge of the tank is not always sufficient, as this may become soaked with solution and hence become conducting.

(b) Dynamo grounded, and steel tanks resting on wet floor, or in contact with water or steam pipes.

(c) Steam pipes running into an electric cleaner, and uninsulated steam pipes from the same system running into plating tanks. This probably causes more trouble than any other one thing.

(d) In the case of old wooden tanks with anode and cathode rods resting directly on edge of tank, the tank edge often gets soaked up with solution, allowing current to pass between the two bars through the solution with which the wood is saturated.

(e) Poor insulation between bus bars.

Small amounts of current leakage, up to 20 or 30 amperes, unless occurring in a single tank may be ignored. In fact it is only when a quite direct short circuit is present that very great amounts of current are lost.

To detect current leakage proceed as follows:

(a) With all tanks connected, but with no work in the tanks, connect the ammeter into one of the bus bars next to the dynamo and start the dynamo. If no current is registered, then connect the ammeter in the other bus bar next the dynamo and try again. If no current is registered this time, you are safe in assuming that no current leakage exists.

(b) If, however, by the above procedure you detect a current which is large enough to worry about, then leave the ammeter connected as it is, and disconnect each tank, in turn, completely from the bus bars (i. e., disconnect both positive and negative leads) noting the ammeter reading after disconnecting each tank. Wherever the complete disconnection of a tank causes the ammeter reading to diminish, the tank should be charged up with that amount of current leakage.

(c) If, after all of the tanks are completely disconnected, the ammeter still shows that a current is flowing, then leakage occurs in the bus bars themselves.

CAUSES OF VOLTAGE LOSSES

Some loss in voltage is unavoidable, but this should be reduced to a reasonable figure. A one-volt loss in a circuit carrying a thousand amperes means a loss of one kilowatt, or about ten kilowatt hours per day. In the course of a year this will amount to from $150 to $200. While this figure may not be impressive, yet where larger amounts of current are used, or larger voltage drops are permitted it may develop into a serious loss.

A drop of one volt between the tank and the dynamo is not considered excessive, but much more than that would justify a redesigning of the power circuit to reduce this loss. The actual money loss caused by the drop in voltage is often not so important as the fact that where the drop is excessive it is often impossible to drive sufficient power through the tanks to accomplish the desired results. As a mater of fact more power is used up in the rheostats than in the bus bars, in most cases.

Excessive losses in voltage may be due to the following causes:

(a) Conductors not large enough in cross section, or of poor conducting material. This is a matter of design. The loss in voltage is inversely proportional to the area of the cross section, and directly proportional to the length; hence, the longer the conductor the larger the cross section required for the same voltage drop.

As regards materials used, one must remember that conductivities of different metals vary over a wide range. Occasionally a manufacturer conceives the idea of saving money by employing iron or soft steel bus bars instead of copper, and in many cases this is done without properly allowing for the differences in conductivity between the two materials.

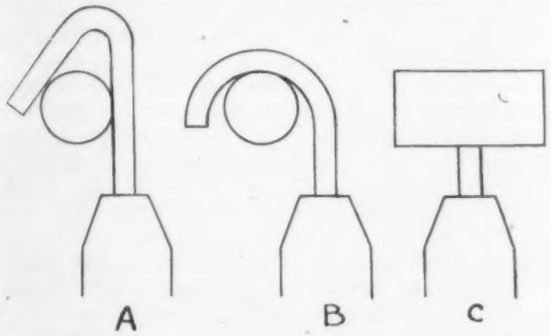


FIG. 21—A SHOWS A BETTER METHOD OF CONNECTING AN ANODE THAN B, BUT C IS THE BEST METHOD OF ALL.

The resistance of soft steel is between 7 and 9 times that of copper. Hence, if a rod of copper 1¼ inches in diameter will carry 1,000 amperes, then it will require a soft steel bar of about 3½ inches diameter and weighing about eight times as much, to carry the same current. The usual mistake in substituting iron conductors for copper is that this difference in resistance is not reckoned with and iron rods of the same size as the proper copper ones are used, with the result that the bus bars become resistors instead of conductors.

(b) Poor contacts. This is the most frequent trouble, occurring sometimes in tank connections, but mainly in plating tanks and between anode hooks and anode bars, as a result of the accumulation of solution encrustations. Frequently, also, screw clamp connections work loose.

LOCATING VOLTAGE LOSSES

First, with full load on the tanks measure the voltage across the dynamo terminals. Then measure the voltage between the bus bars at the other end of the line. If the voltage drop at this point is excessive, then calculate from the cross section of the bus bars and their length, the drop in voltage that should occur, using the following formulas: Resistance of copper conductor equals the length in feet (total of both conductors) divided by the cross sectional area in square inches, and multiplied by the factor .00000753. The voltage drop is then equal to the current in amperes multiplied by itself and multiplied again by the resistance in ohms, as calculated above.

If the calculated drop in voltage is somewhere near the actual drop in voltage then the drop is caused by the conductors themselves, but if the actual voltage drop is very much larger than the calculated voltage drop, then there are some poor connections in the line.

In detecting poor connections, temperature is important; for a poor contact or a conductor of insufficient capacity carrying very much current will heat up so that it can be felt by the hand. In case a contact is so poor that not enough current flows to heat it up, it may be detected by placing the terminals of a voltmeter on either side of it. A reading on the voltmeter scale is an indication that the connection is poor since there is a drop in voltage at this point. A voltmeter having a scale reading to hundredths of a volt is very useful for these determinations.

Poor connections or insufficient cross section in the circuits leading from the bus bars to the tanks may best be traced out by the temperature or by the use of the voltmeter in a manner similar to that described above.

A simple method for detecting poor contact between an anode hook and anode rod is to draw a file across both of them at once. If the contact is very poor a series of sparks will be the result of this test. This test may also be used across the contacts in plating barrels.

PREVENTING VOLTAGE LOSSES

Where possible, in connecting up tank rods and tank leads it will be found advisable to thread the ends of the rods and use heavy brass nipples and tee's, such as are used in connecting water pipes.

As for anode contacts, the first essential is cleanliness of the anode hooks and anode bars. This is assisted by placing wooden shields over the anode rods so that drippings from the work as it is taken out will not foul the anode contacts.

A positive connection between the anode and its hook, obtained by casting the hook into the anode or by drilling and tapping the anode and screwing the hook in, is much to be preferred over the system of boring holes through the anodes and simply slipping the hooks through them.

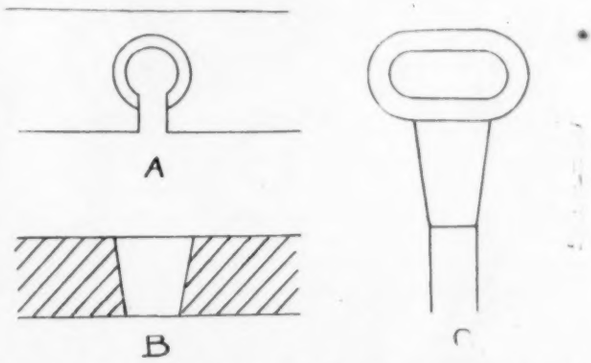


FIG. 22—A MORE EXPENSIVE METHOD OF CONNECTING AN ANODE. THIS INVOLVES THE USE OF A TAPERED SHANK.

Further, the contact between the anode hook and the anode rod may be improved by shaping the hook as in figure 21-A instead of as in figure 21-B. While the hook in B gives only one loose contact point, the hook in A gives two contact points which are much tighter, because the rod becomes wedged in the angle of the hook.

A much better system than either of these would be to use a slightly heavier anode rod, drill and tap it for each anode and connect the anodes directly by means of short rods threaded at each end as in figure 21-C. The extra machine work involved would be permanent and would be more than repaid later.

An excellent though somewhat more expensive device sometimes used for both anodes and work racks is shown in figure 22. A shows the top view of the tapered hole in the anode or work rod. B shows a section of this hole looking from the front. C shows the tapered shank which forms the top of the rack or is screwed into the anode. The narrow part of this shank slips easily through the slot shown in A, and the tapered part of the shank then wedges itself into the tapered hole shown in B, forming a tight and positive contact.

(To be continued.)

BRASS FOR FUSES AND OTHER MUNITION PRODUCTS

A Description of Methods Employed in England for the Production of War-Time Alloys.

Written for The Metal Industry by Alex. E. Tucker, F. I. C. (of Birmingham, England).

At an early stage of the manufacture of brass components for munitions, the Ministry fixed a standard composition of the metal to be used for fuses, etc., and, with only increase in lead, this composition remains the standard at the present time. The expression standard of course implies the practical impossibility of rigidly confining the composition, still it is found that with due care the variations from any given ideal need not exceed one per cent of copper either way and the remaining constituents may be correspondingly regulated.

Unfortunately, however, although it is the intention of casters to obtain the composition, the failures continue to be serious not only in respect to the mechanical tests for tensile, etc., but more particularly to the machining capabilities. In my experience it is still common to find metal supplied for components which cannot be machined at ordinary periphery speed; the output, therefore, is seriously reduced, and cost sheets show a correspondingly upward tendency; if complete analytical control of the materials supplied and the metal produced is taken for granted, such variation from the standard can only be brought about either by carelessness of foremen in not seeing that the proper proportions of copper, zinc, and lead are melted, or by the fact that foreign metal such as manganese or phosphor bronze or, it may be, gunmetal, has got into the swarf used. The Ministry made it a requirement that these alloys were not to be sent among 60/40 swarf, but in practice it has been found that they often are sent, and their presence should be, but often is not, discovered until their evil effects are manifest. Machine tools working these harder metals are often alongside others on 60/40, and as workmen do not know the compositions—all being brass to them—it is all mixed up and sent away as brass. Given, however, a foreman who is competent to produce 60/40 metal when he has the analyses of the swarf before him, the difficulty with these deleterious metals is more apparent than real. The one requirement is the simple one of plenty of floor space for mixing the swarf. It must be recollected that swarf and other scrap is generally received from widely separated works. In order to arrive at the average composition, the best plan is to properly sample a given consignment by taking a convenient quantity from each bag, mix, magnet it, and run it down in a pot, in this way only can a satisfactory conclusion be arrived at as to composition. With this information the bags, therefore, are then distributed as widely as the floor space admits, and emptied not in a heap, but in a uniform layer over the floor. A simple arrangement for mixing consists in having a run way ultimately leading to the casting shop, and having a sieve or sieves on it suitably placed and agitated by power or hand. Girls or boys take shovelfuls of the swarf from different places, and it is thus riddled. The effect is twofold—for under these conditions any material containing manganese, tin or phosphorus, or of other abnormal composition if it is received, is distributed over the mixture, and its effect greatly reduced; secondly, the riddle will hold back any large pieces of iron and other unnecessary matter as well as long turnings, which have a nasty way of hanging up the material in the hopper of the magneting machines. In some works disintegrators are used as mixers, and in others an ordinary revolving and perforated drum, such as forms a part of concrete mixers, but whatever form of apparatus is employed, it is certain that mixing on the lines indicated will be trouble very well spent, and should be practical and economical even on 5-ton lots, because of the vital importance of uniformity as far as is practically possible. The most thorough mixing of swarf is the only way of securing uniformity of composition, and with small pot furnaces no success is possible unless the mixing of large quantities of swarf as completely as possible is practiced; it is really extraordinary how this common-sense practice is generally neglected.

It is a good plan, when the bags are first emptied, to scatter some cheap flux on it, such as salt for choice on account of its cheapness; the swarf can then be slightly damped, the result being that all the particles become coated during the mixing, and so the fluxing of sandy matter and dirt which might lead to unweldable holes is facilitated.

Various machines are in use for briquetting, but their cost is high and prohibitive for small works. But for large outputs there is no doubt whatever as to the advantages of briquetting; a couple of girls can briquette 100 tons of swarf per week. The briquetting implies a further mixing process, which is all to the good, and suitable scraps of metal can be used in the briquettes, thus distributing them over the various casts. The briquettes are conveniently handled and weighed, they save a great deal of loose metal, but, principally, the reduction in melting losses is substantial. A quite considerable weight of swarf is always lost in the furnace when the caster puts it, as loose swarf, into the pot with a scoop; in practice such a loss is unavoidable even with a careful workman, but over and above this loss it will be obvious that the oxidation in a closely adherent mass will be less than when the same weight is thrown into the pot in a loose form.

Copper turnings which, on account of their length, are very troublesome to handle in bulk, can be easily dealt with in an ordinary mortar mill. This method I believe was first used by Messrs. Sutcliffe, Speakman & Co.; the explanation is that the copper leaves the cutting tool in curls having a broken edge on the inside of the curl, this broken serration continues to a considerable depth and, actually, the turning may often be broken with the fingers, but the breaking up is so complete under an edge runner that the product takes the form of small pieces averaging an inch long, which can be shovelled up and bagged, or briquetted if desirable.

The days of the old pot-sunk furnace, as far as large works are concerned, are over, the advantages of the gas or oil-fired furnaces, where either the fuel or the air is used under pressure, being so considerable. Such furnaces have been reduced to a very simple form, and consist essentially of the crucible chamber outside of which the escaping hot gases circulate, the intermediate circular wall being comparatively thin, by this means radiation losses are reduced, and great and easily controlled heats are rapidly obtained; a thin plate iron shell surrounds the fire-clay structure, this shell can be fitted with trunnions and worm gear, etc., for tipping, the burner or burners are generally directed tangentially or may be arranged to burn vertically. Scaling or undue local attack on the pot is in this way reduced. Arrangements are often made for the escaping gases to heat the heavy scrap in a container which can be swung away as desired. Such constructions are cheap, light, and very efficient.

Lead, which has proved so useful a constituent in brass

for machining, can be introduced into the pot as either a copper lead alloy (33 lead, 67 copper) or as lead. A large amount of so-called lead alloy was sold for munition work which was a mixture of shots of copper and shots of lead, the metallurgy of the matter not having been recognized, and much trouble was caused in consequence, and obviously no regularity was obtained. A much simpler method is to granulate the lead in the ordinary way by pouring into water, and mixing the shots with the swarf. This plan was, I believe, first adopted by Mr. Tooth, and has everything to commend it. There is certainly no object with loose swarf in using the more clostly lead alloy. On the other hand, if briquetting is practiced the distribution of lead in the form of shot will not be so easy, and in this case the introduction of the metal by means of a lead alloy of constant composition is to be preferred.

In dealing with large outputs it is convenient to pour the contents of the large crucibles into a heated ladle with a stopper similar to those used in steel works, as it will follow that with any furnace working hotter than another, or if from any cause the metal is not the same in two or more furnaces, the mixture in the ladle will be quite uniform in itself, nothing but clean and well-mixed metal of course can enter the moulds. Similarly the casting temperature is a matter of great importance, and speaking generally the metal should be cast as cool as is practical to insure solid ingots, because by casting cooler, shrinkage holes and the elimination of gases are both reduced. Again the crystalline structure will be smaller in character. The pouring should be as central as possible, and much success has been obtained by arranging a light cast iron head for extrusion or other large billets, which is simply a funnel with an annular space around it; this head rests on the top of the mold. It is heated strongly, and when the metal is ready for pouring, a piece of sheet iron is held over the funnel, and the scoria and dross from the pot is scraped away into the annular space, this tends to keep the funnel hot, and also keeps the skimmings together instead of letting them drop on the floor. The metal is also in this way run centrally into the mold, the small hole in the funnel insures keeping the funnel full of liquid metal, and so the casting approximates to casting from a stoppered ladle. There is no doubt whatever that feeding an ingot as is so commonly done is of no use, and sounder ingots are obtained by taking care that the pour is not interrupted than by feeding. If a fed ingot is sectioned it will be found that the pipe—always caused by shrinkage and always increased by casting the metal unnecessarily hot—has a succession of arches of metal over it corresponding in number to the dribbles of metal the workman has added from the pot in the expectation that these will run in and fill the pipe. The available heat of these dribbles is not sufficient to melt the rapidly setting metal, and only a series of cold shuts is the result of trying. In this connection a paper, "On Some Properties of Ingots," by H. Brearley, Iron and Steel Institute, 1916, should be read. It is a masterly one on the subject.

A good deal of the ordinary daubing used for blacking the molds appears to leave much to be desired. It is common to find little or no care is taken in keeping "blacking" clean and free from dirt, and it is often used much too profusely. Its use is simply to form a layer on the iron, generally a film of carboon, which will retard the attack of the metal on the molds, and if this is obtained as well as a reducing atmosphere for the incoming metal with a minimum of blacking, the best results are obtained. With new molds it is an excellent practice to machine the surfaces all over. An idea following steel works practice may also be used. This is as follows: A small piece of pitch is dropped on the bottom plate or its equivalent, the pitch is fired by the incoming metal, and the smoke produced coats the inside of the mold with a layer of fine carbon. If large furnaces and ladles capable of holding a ton or more of metal are in operation there would appear to be no reason why the steel works practice of casting from the bottom by means of a central git should not be adopted, the molds have a small vent at the top. Sound ingots might in this way be expected, and the present expensive cutting off required for extrusion billets might be avoided. The use of a ladle for casting large section bars should also be attended with economy. Of course, there would be the gits and runners to be considered, but greater uniformity of metal and sounder metal would result.

With some ingots other than extrusion ingots a thin wash of ordinary whiting answers perfectly well; but with extrusion ingots this is not desirable, as in these the skin during extrusion of the bar sometimes turns into the center of the metal, and when this occurred any whiting would lead to spilly bars.

It is not generally recognized that all metals are weldable, the requirement of welding is the intercrystallization of the adjacent surfaces; such intercrystallization or locking together of crystals can be brought about by heat and pressure, especially pressure; the value of this fact is seen in the fact that blow holes in a cast bar if they are clean are closed up so perfectly under the stamping press as to be undiscoverable by any ordinary micro examination. Similarly if two clean surfaces of 60/40 metal are heated to the ordinary stamping temperature and kept free from oxidation and then subjected to pressure, a considerable degree of welding can be obtained, and of course increased by repeating the process, or by keeping the one piece hot while it is under pressure. Under these circumstances it is probable that the large amount of cropping of extrusion billets and bars usually done is unnecessary.

A most useful and simple machine for ascertaining the comparative qualities of brass or other metals in respect to their machining values was described in a paper read before the Iron and Steel Institute, 1913. It consists essentially of a small power-driven bench drill, in which a given number of revolutions together with the penetration of a suitable drill are recorded on a chart. As the drill spindle is driven under a constant load which may be either a dead weight or a weighted lever it is clear that the only variable is the metal operated on. The resultant of revolutions and penetration will generally give a straight line inclined from the vertical, and similarly if the metal is softer inside the line will be more or less convex, and if harder inside this line will be concave to the vertical. The details of the machine are that the drill spindle carries a pinion gearing into a spur wheel on the axis of which is a fine cut screw, this screw carries a split nut which can be released; on this nut is an arm carrying a pen or pencil marking a paper on a drum; the drum is revolved by a cord fixed to the lever or to the drill spindle; when either falls on account of the drill entering the test piece, the drum is pulled round. It therefore follows that the fine cut screw mentioned will give a vertical line which may be confined between two standard red ink lines on the chart, while the entrance of the drill into the test piece will give a horizontal line; the compounding of the two therefore becomes a measure of the hardness or softness of the piece operated on.

The results obtained with this machine have proved very important and interesting; the softening effect of copper on the alloys, free from lead, between 52 to 61 of

copper is apparently nil, all are hard, and so are the results of these alloys with a percentage of iron varying from 0.28 to 2.07, and a copper of from 58 to 61 practically no difference in machinability is shown; all, in the absence of lead, are excessively hard, but the softening effect of lead is greater. On the other hand, with a normal composition the presence of .25 of tin, manganese and phosphorus is easily shown. With so many variables in the composition of ordinary 60/40 metal, further work with the machine is wanted before the specific actions of the respective elements can be determined and co-ordinated.

ARTISTIC METAL FINISHING

Plating Antimonial Lead Fixture Work Without Scratch Brushing.*

Written for The Metal Trade Industry by John Burke.

As antimonial lead work has taken a firm hold in chandelier and fixture houses, many platers who have handled nothing but brass are at a loss as how to handle this work without scratch-brushing. I have done a large amount of this work, and the following is the method that I have used:

When the work comes from the polishing room, it is washed in benzine to remove the polishing materials that may be lodged in the design. After drying in sawdust the work is run through a potash kettle containing caustic, potash and kalye. After rinsing in water, the work is hung in a combination cleaner and plating solution for a few minutes. This solution is composed of:

	English	Metric
Lye	4 ozs.	30 gms.
Carbonate of Soda	4 ozs.	30 gms.
Carbonate of Copper	2 ozs.	15 gms.
Sodium Cyanide	4 ozs.	30 gms.
Rochelle Salts	6 ozs.	45 gms.
Carbonate of Ammonia	4 ozs.	30 gms.
Water	1 gallon	5,000 c.c. or 5 litres

After the solution is made up it is unnecessary to add any metal to the solution to keep it in working order. All that is necessary is to keep it balanced with a little cyanide and lye and carbonate of soda in preparation to the amount of work done. A couple of anodes is all that is required. Run boiling hot and have a faucet over the tank to fill as necessary. A thirty-second strike will be sufficient, if the work is small. Larger work is run in proportion. After rinsing in water plate in an acid copper solution for about 20 to 30 minutes. Use 3 volts pressure. After rinsing boil in a solution of unslaked lime (½ lb. to the gallon), to neutralize the acid. Boiling for 5 minutes is sufficient. The work can then be scratched or colored. After coloring, wash out in whale oil soap and then rinse in hot water. Potash, rinse; cyanide, dip, and plate in desired solution. I have handled on the average 10,000 pieces a day with very little trouble.

PREVENTION OF SPOTTING OUT

After the work comes from the acid copper bath it is rinsed in cold water. Passed through a solution of milk of lime, made up of 8 ounces of calcium oxide to the gallon of water, and boiled for 5 minutes. Then the work is rinsed in cold and hot water and scratch-brushed or colored. After brass plating the articles are rinsed in cold and hot water, and then left in a solution of sodium tartrate and water that is nearly at boiling point for 3 minutes. The operation must be closely watched or the brass color will turn to a bronze if left too long in the bath; rinse in cold and then in hot water. If possible place work in drying oven for one or two hours. Do not let the oven get too hot, as the antimonial lead casting will shrink away from the plating and blistering will be the result. By following the above method closely I have not had one case of spotting out in two years.

AN EXAMPLE ANTIMONIAL LEAD PLATED WORK.

*A paper read at the St. Louis, 1917, Convention of the American Electro-platers' Society and submitted by the author to The Metal Industry.

UTILIZATION OF WASTE METALS IN THE PLATING DEPARTMENT *

A Description of Methods Whereby the Plater Can Aid in Conservation of Materials.

By Charles C. Martel, Chicago Branch.

In large plating establishments the accumulation of scrap metal is very rapid, which is especially noticeable when inventory is taken.

The waste metal in plating departments consists of crystallization of electrolytes on the plating tanks, which is sometimes caused by leaky tanks or in the training. Also the accumulation of metal on plating barrels used in Roto-Platers, plating baskets, racks, hooks and wire used for suspending work in the plating tanks.

Silver being the most precious metal used in our plating department, being mostly used for silver plating, automobile lamp, and motorcycle lamp reflectors, hundreds of these reflectors being plated every day.

The writer will endeavor to explain in a practical way the methods used for saving waste silver.

The deposition of silver on reflectors as practiced in our plating department consists of the following operations:

Electric cleaned—swabbed lightly with lye—rinsed in water, dipped in hydrochloric acid, rinsed again in clean, cold water, flashed with nickel, washed in clean water, then struck up in the silver strike solution, then placed in the silver plating electrolyte without being rinsed, and allowed to remain until they have received the required thickness of deposit, which is from two minutes to fifteen minutes. Current density, three amperes per square foot, cathode revolving ten revolutions per minute.

Composition of silver strike:
Silver cyanide, ½ ounce.
Sodium cyanide, 6 ounces (free).
Water, 1 gallon.

Composition of silver electrolyte:
Silver cyanide, 2½ ounces.
Sodium cyanide, 3 ounces (free).
Water, 1 gallon.

Composition of nickel flash solution:
Single nickel salts, 18 ounces.
Boric acid, 2 ounces.
Sodium chloride, 2 ounces.
Water, 1 gallon.

Scrap nickel is used exclusively for anodes in the nickel flash solutions. The retainers for the scrap nickel consists of lead strips 3 inches wide by ¼-inch thick, reinforced by pieces of maple. Carbon cups such as used in batteries are placed and fastened to the lead strips by using lead binders, thus affording a good contact.

The above mentioned carbon cups measure 4 inches in diameter by 6 inches deep, and are submerged 20 inches in the electrolyte.

We have one nickel tank of 500 gallons capacity that has been in use 26 months as a flash nickel. No trouble has been experienced by the use of the retainers and it has only been necessary to clean the retainers twice during the 26 months.

The advantage in using the anode retainers described is that there are only the cathode rods visible on top of tank, also no anode hooks are exposed to corrosion. Reloading the containers with pieces of old nickel anodes has been necessary every three or four months, which proves that anode corrosion is good.

Electro motive force used is 1½ volts for wired work. Three volts for racked work.

Current density, 4 to 6 amperes per square foot.

*Reprinted from American Electro-Platers' Society Bulletin.

The writer expects in the near future to equip all electro-plating units in our plating department with submerged anode holders, doing away with anode hooks of any description, and no anode rods will be required, which represents considerable capital tied up. This is especially true in large plating establishments, where tons of metal is used as anode rods and anode hooks.

Microscopic tests have been made of the deposit from the above mentioned plating unit and has never shown any pits caused by low metal efficiency, hydrogen or organic matter.

Having given you a description of the nickel flash tank used for reflectors, I shall now describe how scrap silver is used in our plating department.

In three of our silver plating tanks nothing but scrap silver has been used in twenty-seven months. Not that I advocate the use of scrap metal for anodes in reference to new anodes, but on account of change of models and head-on collisions and the tearing of bark off the trees by joy riders, there is bound to be a considerable amount of silver to be reclaimed and used over in our establishment. So much so that after converting enough of the old silver to silver cyanide, the writer has had enough old silver to maintain the above mentioned three silver tanks for nearly two and one-half years with scrap silver anodes.

One of the silver tanks mentioned is used for silver plating small reflectors, such as motorcycle lamp and side-light reflectors.

Old plating racks are stripped of silver in this tank by being suspended from the anode rod, thus maintaining the solution with nearly enough silver to replace metal taken out by deposition.

Replenishing with cyanide of silver has only been necessary twice in twenty-seven months, 20 ounces being used each time for 150 gallons of electrolyte.

Composition of electrolyte:
Metallic silver, 2 ounces.
Free cyanide, 3 ounces.
Ammonium chloride, ½ ounce.

The other two silver plating tanks are used for plating large headlight reflectors. These two tanks are equipped with steel anode holders that are submerged to within two inches from bottom of the tanks.

The steel anode holders or retainers are made of half-inch steel, two inches wide, running lengthwise of tank.

Cup shape sheet steel shells are riveted to the above mentioned steel rod with iron rivets. The cups are 12 inches apart.

Impure silver anodes have been used ever since the steel anode holders were installed. Some of the anodes consists of silver, zinc and copper, for the reason they were made by melting old plating racks that were heavy plated with silver without removing the silver from the racks previous to the melting. No doubt some of the zinc was thrown off as zinc oxide in the melting, possibly a large amount, for I have experienced no trouble by the precipitation of silver as metallic grain silver, which proves that the zinc in solution must be a small amount.

As to the content of copper in these electrolytes, there is a considerable amount, so much so that the solution could be changed over and used for cyanide copper plating very easily.

Reflectors are rotated while being plated and the elec-

tro motive force never exceeds nine-tenths of a volt. Rotating throwing off the hydrogen-deposition of the next lowest potential, which is silver, in the above solution then takes place.

Zinc discharge potential being the highest..... .90
Copper discharge potential being the next highest .81
Silver discharge potential being the lowest..... .28

The exact figures are not at hand.—Prof. Oliver Watts.

But we will take brass plating for an illustration:

By lowering the voltage, copper is deposited instead of brass. And by raising the voltage, zinc may be deposited in excess. And again, by using the proper electromotive force, you may deposit brass from the same electrolyte. The same rule applies to deposition of silver from electrolytes that contain silver, copper and zinc.

An electromotive force of less than one volt produces a good silver deposit, but when the electromotive force exceeds one volt some of the other metals are alloyed with the silver, making same very hard. The deposits resembling white bell metal, such as is used in Japan, no doubt caused by the presence of nickel.

To those of you that are not familiar with the potentials of the different metals:

Depositing silver from an electrolyte containing silver, copper and zinc, may seem somewhat strange. For another illustration we will take black nickel solution. A black nickel or gun metal electrolyte contains more than one metal, and the deposit can be made black or light grey by changing the electromotive force; high voltage will deposit the nickel so rapidly that instead of the deposit being black nickel, it will be a fairly good white nickel, and in the same electrolyte, by using a very low voltage, the deposit is changed to a beautiful black deposit.

Current density and electromotive force for reclaiming old metals in the plating department are great factors, as much so as the so-called mysterious chemicals.

For stripping silver from other metals the electrolytic process is used, which is as follows:

A tank 30 inches wide, 24 inches deep, by 5 feet long (inside measurements), is equipped with the rods running lengthwise same as any ordinary plating tank, with the exception that the two outer rods which are generally the anode rods, are made the cathode, and the center rod, which is made the anode. Thus making the piece parts that are being stripped the anode. On the outer two rods four or more zinc electrodes are suspended and directly underneath the zinc electrodes are placed crocks or vessels made of any material that the electrolyte will not attack. Also the crocks used are large enough in diameter to catch the metal that falls from the zinc electrodes.

Any old silver solution diluted with water, if very concentrated, will answer for the electrolyte. If old silver solution is not at hand, a solution made up of the following will do the work:

Cyanide, 1 ounce.
Ammonium chloride, 1 ounce.
Water, 1 gallon.

We have been using an old silver plating solution that has been in use a number of years.

Analysis of the solution when we started to use it for stripping was as follows:

Metallic silver, 1.9 ounces.
Cyanide, 5.7 ounces.
Per gallon.

January 3 of this year the analysis was:

Metallic silver, .7 ounces.
Cyanide, 1.3 ounces.

Showing that a very small amount of silver is held in solution when the unit mentioned before is not in use.

Carbon electrodes are suspended as anodes and allowed to remain in the electrolyte until the unit is used again.

The recovery of silver that has been stripped from piece parts is very simple. All that is necessary is to lift the crocks from the electrolyte, empty the solution from the crock back into the stripping tank, which, if done carefully, leaves all the grain, silver and zinc in the crock, ready to be washed and reclaimed, which is done by washing through five or six waters, preferably hot water. This is done to remove cyanide.

Next comes the separation of zinc from the silver by using dilute sulphuric acid or hydrochloric acid. The zinc being taken up by the acid, the mass should be stirred a little occasionally, and when no more bubbles are shown in the acid solution the acid solution is poured off and there remains only grain silver, which in appearance resembles sand. After washing the acid from the grain silver it is made up into silver cyanide, or sent with the other scrap silver, such as old plating racks, to the foundry and made into anodes.

Aluminum, iron or carbon may be used instead of zinc for cathodes, but in our establishment zinc has been preferable.

By using a piece of metallic zinc as cathode and a platinum anode, electro analysis of silver in solution should be very practical for plating departments, doing away with the dangerous method of using hydrochloric acid.

As this paper was not written for the purpose of showing you gentlemen how to analyze, I will now explain the methods used in the handling of the metallic salts that are scraped from plating tanks, by saying that the only precaution necessary is not to mix the different metals, such as zinc with nickel, or copper with nickel, etc. In short, the salts of each metal is kept separate.

The scrapings from the nickel tanks and duplex tanks are gathered once a month, and from and around the silver tanks once every three months.

Old salts gathered from the nickel tanks are dissolved in hot water, allowed to cool, skimmed off, filtered through sand and used as stock solution for the Roto-Plater. Before using as stock solution a piece of steel is allowed to hang in the stock solution a few hours, then examined for the presence of copper. The salts gathered from around the duplex copper tanks are redissolved, filtered and used as stock solution for the duplex copper tanks.

Scrapings and sweepings from around the silver tanks are boiled thoroughly and filtered and allowed to cool. Then a small amount of ammonium chloride is added and the silver is recovered from solution by electrolyses.

In conclusion, I will say the methods explained in this paper were used upon a commercial basis, using the laboratory as a guide, necessitating the utmost consideration as to the smallest details.. Thus maintaining a high standard of electro deposition as required by the engineer of methods, also that great economic results have been obtained.

Furthermore, discussion and criticism of this paper is respectfully invited, also expert advice at all times is absorbed, remembered and appreciated.

DISCUSSION.

A Delegate: I would like to speak on this paper. I think the man is using something that is very expensive and his methods are exceedingly expensive, for the simple reason he is using brass, and then he is melting up his brass and loses all his brass converting it in solution,

and it is a hard job to get the copper out. Then another thing, he is using the zinc in strip solution as the cathode, and then he is dissolving the zinc and he is losing the zinc. Why not use graphite? Use that and then all you have to do is to just strip that graphite off if you want to put a coating of loose graphite on it, so much the better, and all you have to do is take a piece of graphite and have a piece of wood around it like when you went to the little red schoolhouse, and after you have deposited it on the zinc, strip it off and the metal will fall to the bottom of the solution. Another thing, that is, using ammonium chloride to precipitate silver when he could use sodium chloride instead. Ammonium chloride is quite expensive used as a precipitate, so it seems to me that the gentleman has exceedingly expensive methods of handling things, and so far as subversion of anodes in the silver solution, I believe it is common practice among all large silver plants to have that done as a container for using old waste anodes; go down to the 5-and-10-cent store and buy a broiler, cut the hooks in the side and put the two broilers together and put the anodes in them and you have a better container, and you get full square inch surface, putting the anodes one against the other and when your anodes have been in there two or three days, pin it up, take some old anodes, place them in back of it, shut it up again, get some hooks like you used on rubber overshoes for clips on the sides, and put a little twisted wire on the bottom, put a hook on it, hang it on your anode rode about two inches from the bottom of the tank, or something like that. In this way you can use all the old anodes you have for nothing. Another big utilization of waste products in the plating room should be his rinse water; there is more silver goes over the rinse water than anybody has any idea. I worked out a little scheme I am willing to pass along on the recovery of silver from rinse waters. That is, take an iron tank that will contain equal volume of the rinse water that you are using in your plating room; have that connected up with steam pipes so you can evaporate it; over that tank have a hot plate of black iron, not galvanized, so it will enclose that tight. Now, on one side put an "S," like an elbow on a stovepipe, to lead it outdoors. Now, you can evaporate that solution down to the same volume as you would lose from mechanical losses in various forms; your solution had that silver and cyanide, which are all saved, back in your solution, and have no waste of precipitation in your rinse water. The reason of the covering over the top of the tank of this type is to prevent the emission of carbonates. I have made quite a number of experiments along that line and found that by having the glass covered up, having the "S" elbow coming out so that when the condensation commences it will fall outdoors, and that steam will act as a cover over the top of the evaporated solution and prevent the formation of carbonates; so if they were to utilize the different things of the plating room, silver especially, those methods probably would be more economical. Another thing, don't blow air into a silver strip.

Air from a quarter inch pipe with about 15-pound pressure blown into a 10-gallon quantity of sodium cyanide will bring the carbonates up. That is, with four ounces of cyanide per gallon will bring the carbonates up from about a forty-six to over four ounces per gallon showing rapid composition. Agitate your work and make it go fast, go out into the solution; you get your agitation just as well without any formation of carbonates.

C. H. Proctor: I would throw a little light on the use of ammonium chloride; it is not used as a precipitating agent.

A Delegate: At the end of that paper the gentleman spoke about the ammonium chloride being added to his solution to precipitate silver.

C. H. Proctor: In the original formula, I want to explain, the reason why he used ammonium chloride in the silver solution. I am not referring to the method used for the recovery of silver. A few years ago, perhaps, as you remember, there was considerable discussion as to the recovery of metals. The Badger Brothers Co., I think, expended in the neighborhood of nearly $10,000 in trying to prevent spotting out. And they had various theories in regard to the continuous spotting out. Of course, spotting out still takes place in spite of every effort. The solutions were discarded, new solutions made up of absolutely cyanide and pure silver cyanide, and yet the spotting out continued, so after the expenditure of all those thousands of dollars the results were identically the same. I am not going to say that I was the means of overcoming the spotting proposition, but sometimes I make suggestions and I cannot hardly reason why I make those suggestions, but I did suggest to Mr. Martel the addition of ammonium chloride as a possible agent in overcoming spotting out. Now, I don't know why I made that suggestion, but at the same time he started to use ammonium chloride in his solutions, and I was in their plant some few months ago and Mr. Martel told me that the addition of ammonium chloride in the silver solutions, I am not sure just exactly the proportion he used, had practically eliminated the spotting out and that is perhaps why he continues to use ammonium chloride in his silver solutions. I do not know that ammonium chloride has ever been advised as an agent in silver solutions; I have myself advised in preparing solutions. I just mention those facts to throw some light on why Mr. Martel used ammonium chlorides in his solutions. I will let the matter stand so far as Mr. Hogaboom is concerned. I think his point is well taken.

Mr. Mesle: It is not very often we get a chance to offer a suggestion over Mr. Hogaboom's, but the question arises of using graphite cathode in a strip for the recovery of silver. Why wouldn't it be better to use waste or scrap silver anode, simply deposit on that scrap silver anode and in turn use that anode again in silver plating.

A Delegate: May I answer those two points. One point is that an iron mesh of such a dimension, half-inch, and hooked onto the mesh, will give you a lot of unsoluble anode surface, and the more soluble and the less unsoluble surface you have the better. Therefore, the broiler with those small wires between is much more economical and as far as silver anodes in a strip, the cost of the silver tied up at eighty cents an ounce in a silver strip is exceedingly expensive. The cost of anodes in a tank containing about 140 gallons is in the neighborhood of $300—between $300 and $300, and that is tied up there nearly all the year round. Now, if you take the charges against that for just leaving it there instead of the charges against graphite cathodes, I believe that you will find it much more economical, I think.

Mr. Mesle: I still think I have a point. For instance, I have ten scrap anodes; they are all scrap, not used in my plating vat any more. By Mr. Hogaboom's method I put those ten anodes on the anode side and redissolve off of them by electrolysis; I take five of them and five on the anode—and get those five anodes over on the cathode and then use them again, so there is a saving in current with no greater investment in silver.

A Delegate: Why not use a steel cathode?

Mr. Mesle: You have to electrolize twice the amount of silver to get the same amount over on your cathode; you are going to use again and just saves the electrolysis of 50 per cent of your scrap silver.

EARLY BRASS DAYS IN CONNECTICUT

A Story of the Trials and Struggles of the First Metal Workers.

Written for The Metal Industry by L. M. Ruttenber.

Up to within ten years ago a tall chimney marked the site of the spot at Wolcottville (now Torrington, Conn.), where the first brass kettles produced by the roller method were made in America. For some time previous to that period the ruins of several small buildings had withstood the shock of time and the ravages of the elements. There are at present nothing but a few foundations to indicate the one-time presence in this vicinity of pioneers in this field of effort.

It was in 1834 that the effort was launched and for a number of years rode the breakers of a vicarious business career. It was through this struggle to establish a foothold for the new enterprise that the foundation of the present massive brass interests won a permanent place on the industrial map of Connecticut.

EARLY CAPTAINS OF INDUSTRY.

At that time the old Wilson mill privilege and property was purchased with other land on the south and west sides of the Naugatuck river for a dam and raceway and for the location of buildings. The business was conducted in the name of Israel Coe, then of Waterbury, but who removed to Wolcottville. Anson G. Phelps, of New York, and John Hungerford were associated with Coe, each owning one-third of the stock. Israel Holmes, of Waterbury, had an interest in the business also, and located in the village for the purpose of taking charge of the manufacturing part of the business. The enterprise included the rolling of brass in connection with the making of brass kettles.

Christopher Pope, an Englishman, was the prime mover in the making of brass kettles, although he was of no benefit to the business as introduced in this section.

STRUGGLES OF THE PIONEERS.

Soon after the founding of the business, Holmes went to England for the purpose of securing men and machinery. Abroad he met with every obstacle that English manufacturers could throw in his way. Fearing the outcome of competition from this new quarter, agents of English makers of brass spread a propaganda aimed to discredit the Yankee pioneers, and it was with the greatest difficulty that the trip was made productive of anything except the most discouraging results. In addition to the obstacles that he encountered on English soil, Holmes had nothing to offer mechanics to handle his machinery when they should arrive in this country. There were no homes for them or means of transporting men and machinery to the site selected for the plant. It was only with the greatest perseverance that the Britons and imported machinery were safely deposited in Wolcottville. In the time intervening between the arrival of equipment and the actual process of getting under way the men were idle about the village. It is a matter of record that they took the expedition and its aims lightly, fell to drinking in the taverns, at that time too numerous for the moral well-being of tipplers, and in many cases fell into the hands of the authorities on serious charges. Their arrival was soon frowned upon by the natives and the staid New England folks looked with a fishy eye upon the swaggering Englishmen and subsequently grew to regard the entire proceedings with a sort of grim tolerance. Severe penalties were eventually imposed to stop the gross dissipation at that time in vogue throughout the settlement. To further complicate matters, Pope embarked in another venture and took three of the men with him. Pope appears to have been a sort of promoter, a good bit of a Wallingford and something of a dreamer. His career terminates in oblivion. This, notwithstanding the fact that he gave great promise of executive ability in his earlier relations to the brass industry. Following his departure, however, activities were launched after a fashion.

DIFFICULTIES ARISE IN MIXING METAL.

Almost immediately difficulty arose proportioning the metal so as to form a compound that could be subjected to the hammering and ameliorating without cracking. These conditions enveloped the making of brass articles by the roller means until 1842, when Coe went to England for the purpose of seeking a solution to the problem that threatened to swamp his fortunes. On this trip he succeeded in securing the right mixture and metals and returned to resume the mercantile conflict. His persistence and energy can be traced through the early stages of the operation of the plant with unflagging devotion.

About this time Hiram Hayden, of Waterbury, hit on a new process called the roller or spinning process by which a smoother surface and uniform thickness was secured. Up to this time, from a financial point of view, no great rewards had been reaped. These new methods soon succeeded the battery process and the Wolcottville venture languished as a result.

The rolling process was a success until 1837, when, owing to a general suspension of business throughout the country, consequent money depression and failure to collect outstanding accounts, the firm passed through many difficulties.

THE BRASS TRINITY.

On May 19, 1841, the special copartnership headed by Israel Coe was dissolved and a stock company formed under the name of the Wolcottville Brass Company. The capital stock was $56,000 and Israel Coe, Anson G. Phelps and John Hungerford headed the company. In 1842 Coe went to Europe again and Hungerford was appointed president. In 1843 Holmes retired. In 1844 the company passed to the control of Anson Phelps. L. W. Coe remained as secretary and treasurer until 1845, when he resigned. Subsequently he was elected secretary of the Waterbury Brass Company, of which Israel Holmes was then president. L. W. Coe then removed to Waterbury, where he resided until 1863, when he purchased the property of the Wolcottville Brass Company and formed what is now known as the Coe Branch of the American Brass Company. Until 1852 the company at Wolcottville was fairly successful, but declined rapidly owing to the decline in the batter process and the great panic of 1857. Modern history dates from April, 1863, when L. W. Coe purchased the entire stock for $40,000, became liable for its debts and controlled the franchise.

EARLY IMPLEMENTS.

The kettles were hammered into shape from blanks. Before this brass kettles had been cast. At first imported cast blanks were used. Then the attempt was made to cast blanks, then to use sheet brass. But the right mixture of the metal was not discovered, nor was a satisfactory annealing process found. The hammer was a long, wooden beam shod with iron. The noise of the shop was said to have been deafening, the workmen filling their ears with cotton. At first it was thought that the difficulty arising from the cracking of the metal was due to defective skill on the part of the workmen, and this resulted in the importation of experts from England.

The three establishments in Waterbury, the Scovill,

Benedict and Burnham and Brown and Elton, with the Wolcottville concern, were the only ventures in the brass industry until 1840. It is believed that at this time they were the only establishments in the country devoted to the mixing and working of sheet brass.

A GLIMPSE OF EARLY INTERNATIONAL TROUBLES.

At the time the Wolcottville company was endeavoring to absorb English methods and secure workmen and materials abroad, the laws of England were very strict with a view to preventing enterprising manufacturers in the United States and elsewhere from profiting from the industrial development of the island. These laws forbade under heavy penalties the exportation of machinery or models and the enticing away of workmen from their employers. Mr. Holmes on the occasion of his visit offered excessive prices for machinery needed and so obtained through the manufacturers permission to export it. Thirty-eight men were finally secured in addition to the machinery and landed in this country at Hartford. The company went by road to Wolcottville to find that the mill was not ready. It was impossible to keep all the men together, but enough remained to start the industry.

As early as 1835 it was found that the kettlemen at Wolcottville were unwilling to train apprentices, and the system was adopted of regulating their pay by the pound of product. Under this stimulus they were persuaded to employ American helpers. This system of paying a skilled mechanic a fixed price per unit still continues in many places. The mechanic then hires his own helpers, using machinery furnished by the proprietors. This system, together with the fact that individual skill plays such a large part in the value of some workmen has made a uniform wage scale impracticable. The first American helpers were paid $20 a month, this being increased to $1.00 a day by 1850.

CASTINGS—"AS PER SAMPLE"

WRITTEN FOR THE METAL INDUSTRY BY W. H. PARRY.

When will manufacturers of castings get down to brass tacks and stop attempting to fool their prospective customers by seeking new business on the strength of samples of their "every day work," which in most cases is not anything of the kind?

Splendid entertainment was to be had for the asking at the recent foundrymen's convention held at Boston, Mass., by observing the methods employed by concerns to convince prospective buyers of castings, molding machines, non-ferrous metals, coke and pig iron, the advantages to be gained by using this or that product. The dealers of molding sand have been omitted from the above list purposely, as there is some justice to their claim that castings made from their sand will be the "best ever," though it is a well-known fact that very rough castings can be made from grade "O" sand without half trying.

The moss covered trick of showing a gate of castings "just as they came from the sand" is still being worked at the exhibition of foundry work and appliances, and it does seem as if somebody must fall for the trick. If the best metal, the best molding sand, the best facing and the best parting compound are given to an inexperienced hand he will make the rottenest casting imaginable. Yet if one will but listen to the smooth talker at these exhibitions he will tell you that to make bad castings when using his product is an impossibility.

The tricks resorted by by some of the exhibitors are such that many experts are apt to be fooled, as the following will prove. At a very large booth where foundry appliances were shown, a goodly number of castings made by the help of their machines, were so placed as to be the most prominently displayed portion of their exhibit. In appearance the castings were the most marvelous ever made and they were made on the machines of this particular manufacturer. How they were made is another story, and while it is not a pleasant task to act the part of a discloser of secrets, still the fraud perpetrated was so raw that to expose the trick is a matter of justice to the long-suffering foundrymen who have swallowed their talk, hook, line and sinker, and have lost their jobs because they could not make castings as good as those shown at the exhibitions.

Weeks before the Boston exhibition these castings were filed and scraped all over by metal pattern makers who were told what was required of them. They were then turned over to the expert polishers, who were also on to the game of faking castings. The last process they were subjected to was the sand blast, which, of course, gave them the appearance of freshly made castings "right from the sand"—BLAST.

So near perfection were these castings that an owner of an art foundry, famous for his ability in the foundry line, acknowledged that they were far ahead of anything he had ever made. The pity of it, however, was that he never tumbled to the fraud and went home to Pennsylvania fully convinced that he was not the only "pebble on the beach."

We all are aware of the solicitor seeking business for his foundry whose chief stock in trade is the sample he carries to prove his claims of first class work at the lowest possible cost per pound or piece. Rarely are these gentry conversant with foundry practice, but they make up in nerve what they lack in mental equipment to talk sensibly on how castings are made. While their samples are invariably good, you will find that their castings are not.

It is only fair to state, though, that there are exceptions to this rule about solicitors, as evidenced in one case where a salesman showed his samples and innocently confessed that his knowledge of the casting game was gained by an occasional visit to the New York City office of a foundry whose works were located in New Jersey. His was the stereotyped story, but as he was an old man and so unsophisticated a trial order was given him, with the result that from that time on and to date, a period of time covering about seven or eight years, the castings from that foundry find a ready market at the receivers' end. Why? Because every casting is a work of art and as soft as mush, even in the thinnest sections, and why this foundry is not making all the castings for all of the concerns in the United States, is a mystery to me, as they always make all of their castings "as per sample."

PULLMAN BRONZE FINISH.

Pullman bronze may be produced in at least three distinct shades. The methods are as follows: Sand blast the brass parts, then immerse them direct into a dilute and warm liver of sulphur solution just so that an olive green tint is given to the brass; then wash in water, dry and lacquer.

For a medium shade the liver of sulphur solution is made stronger, after which the articles are scratch brushed after being dried out, and then a second quick immersion is given in the liver of sulphur and then dried and lacquered. C. H. P.

DRIVE FOR HIGHER COPPER PRICES

SOME COMMENTS ON THE SITUATION REGARDING THE GOVERNMENT PRICE OF COPPER, WHICH MAY BE CHANGED JUNE 1, 1918.

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

One of the old-time periodical campaigns in copper securities was inaugurated about six weeks ago and the movement has increased in force as the price of shares have advanced in the market. Simultaneously, the question of an increase in the Government price of copper metal has been agitated and such headway has been made, apparently, that consumers of copper, as in times before the war, have been solicited to place their orders at once for future shipment in order to escape paying a higher price after June 1.

The advocates for an advance in the selling price to be allowed by the Government claim that the productive cost has increased 1 to 2c. per pound since the price of 23.50c. per pound was established and that a further increase in cost will result from higher charges for refining. The claimants for an advance in the market have been very solicitous about the smaller producers, who they say are unable to exchange an old dollar for a new one under present conditions.

IT IS DANGEROUS TO WORK AROUND MOVING MACHINERY WITH UNCONFINED HAIR.

THERE IS NO DANGER OF BECOMING INJURED WHEN A CAP IS WORN.

Opponents to the advance in the selling price point out that while there was a temporary increase in productive costs during January and February, due to scarcity of fuel and to freight congestion when domestic production of copper was necessarily reduced, that this condition no longer exists and with an increase in output resulting from the more normal movement between smelters in the West and refiners in the East, productive costs will again be reduced to at least what they were in 1917. Numerous statements made by both large and small copper companies, recently, covering operations in 1917, indicate that there was a net profit even after charging off war taxes of from 7 to 14 cents per pound. This, of course, is more than ample to insure profitable working of the various properties. It is significant that the large producing companies themselves, have not been conspicuous in the movement for the higher selling price, naturally, as they are not opposed to larger profits.

In the last week or two, according to reports in Wall street, some of the large companies have indicated that if an advance is granted in the selling price that wage scales may be advanced and refiners' contracts readjusted to a more profitable basis. The War Industries Board, it is understood, will be asked to make the selling price 25 cents per pound to become effective after June 1.

The claim that higher wages may be paid to labor may have some appeal to the Federal Trade Commission, but the latter has been investigating the situation independently and may not be so amenable to an upward cost in the price as operators in the copper campaign seem to think. The proposed increase in the charge for refining does not average over .647c. per pound and this the large companies are well able to absorb.

The claim that a higher selling price is necessary to stimulate production cannot be substantiated because the March and April production increased 15 to 20 per cent, and in some cases even more, while the imports in January-February, when domestic output was reduced, were at the rate of 22,000 tons a month, this being 2,000 tons greater than the average monthly imports in 1917. The withdrawal of ships from South American trade for trans-Atlantic service will temporarily cut down arrivals from Chile and Peru, but this will be overcome later, when cargo boats are available. The indication is that the total production of both blister and refined copper this year will be record-breaking.

A meeting of the War Industries Board with the copper producers has been called for May 22 and possibly some definite action may be taken soon after this issue of THE METAL INDUSTRY goes to press. At the date of writing this article, however, April 27, there seems to be no sound reason why there should be any advance made in the selling price of copper, as the profits already secured to producers are greater than those realized by manufacturers of other metals.

COPPER CASTINGS FOR ELECTRICAL PURPOSES.

A Paper Presented at the Thirty-Second General Meeting of the American Electro-Chemical Society, in Pittsburgh, Pa., October 4, 1917, Available Now for the First Time.

By G. F. Comstock, Metallurgist, the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

[Abstract.]

The difficulty of obtaining sound castings of pure copper is ascribed by the author to its rapid absorption of oxygen and other gases when it is melted, the gases being evolved from the cooling copper, forming blow-holes, and the oxide forming films of copper oxide eutectic between the grains of metal.

After reviewing the history of attempts to avoid these difficulties, the results of using silicon as a deoxidizer in a certain manner are described, by which complicated and large sand castings are made with 75 to 85 per cent electrical conductivity.

Photomicrographs of the castings cast without additions, badly oxidized, and deoxidized by various additions, are shown.

It is only within the last fifty years that the refining of copper has become so efficient as to make possible the transmission of power by electricity with negligible losses due to resistance. Before 1860 the resistance of the usual grades of copper, even in the form of wire, was only about 50 per cent of the standard which we have today. Then Matthiessen brought out his classic work on the electrical conductivity of alloys, including the paper "On the Effect of the Presence of the Metals and Metalloids Upon the Electric Conducting Power of Pure Copper," published in "Philosophical Transactions," 1860, pp. 85 to 92. This work by Matthiessen emphasized the importance of eliminating all possible traces of impurities from copper to be used for conducting electricity. For instance, he found the conductivity of copper with 1.6 per cent zinc to be only about 79 per cent of that of pure copper, both being in the form of wire; with 1.3 per cent tin it was decreased to about 50 per cent, with 0.1 per cent aliminum to 76.5 per cent, with 0.5 per cent iron to 36 per cent, while only 0.13 per cent phosphorus decreased the conductivity to 70 per cent, and even traces of arsenic, to 60 per cent.

The publication of these results had considerable influence in encouraging progress in the direction of more complete purification of copper in refineries, and soon the conductivity of the average copper wire turned out for electrical uses rose from around 50 per cent to about 98 per cent of the figure which copper should attain. At the present time it is unusual for standard copper wires to run much below 100 per cent in conductivity, this figure meaning that a wire one meter long and of such diameter as to weigh one gram has a resistance of 0.15328 ohm at 20 deg. C.

Before passing to the consideration of castings, which really form the subject of this paper, it is desired to make a brief reference to the work of Lawrence Addicks on the conductivity of various grades of copper. A paper by him was published in the Transactions of the American Institute of Mining Engineers, Vol. XXXVI (1906), page 18, on "The Effect of Impurities on the Electrical Conductivity of Commercial Copper," in which he gives the relative decrease in conductivity per unit of impurity added for sixteen of the more common impurities in copper wire. This factor of decrease in conductivity per unit addition is thus 720 for arsenic, 600 for phosphorus, 500 for aluminum, 140 for iron, 70 for silicon, 67 for tin, 30 for zinc, 25 for oxygen, and 3 for lead. The above ratios are intended to apply only to small decreases in conductivity, or to very small additions of the respective

Since it is known that in order to get copper wires of high conductivity it is necessary only to start with extremely pure copper bars, it might seem a simple matter to secure all kinds of copper castings of equally good conductivity by the same means, or merely by using pure copper. But two difficulties are encountered when this is attempted; first, sound castings are almost an impossibility, and second, the pure metal in the cast condition is too soft and weak to give the best satisfaction in most electrical uses.

The difficulty of obtaining sound castings of pure copper is caused by its rapid absorption of oxygen and other gases when it is melted. The gases not only dissolve in the molten metal, but copper oxide is also formed, which is held in solution until the metal freezes. When a casting is poured, the gases are evolved from the cooling copper forming blow-holes, and the oxide comes out of solution forming films of a copperoxide eutectic between the grains of metal. These films and gas holes naturally impair the electrical conductivity of a casting as well as weaken it mechanically, because of the presence of less pure copper in a given cross-section. Casting in a cold metal mold, which chills the copper very fast, reduces the severity of the unsoundness due to gas holes, but most castings by reason of complicated form must be cast in sand to make their production financially practicable.

The second difficulty with pure copper castings, that of softness and weakness, cannot be overcome except by adding some other metal to the copper, thus making it no longer pure, or by giving the casting some mechanical treatment such as forging, after which it is, properly speaking, no longer a casting. Where cast copper has strength of only 20,000 lb. per sq. in. (14 kg. per sq. mm.) and a Brinell hardness of about 35, small bars of the same material after forging may have a strength of 35,000 lb. per sq. in. (24.5 kg. per sq. mm.) and a Brinell hardness of 70.

Foundrymen called upon to make castings of copper for electrical uses have in the past generally added an impurity intentionally for the purpose of deoxidation, and have thus raised the hardness and strength of their castings, although at the expense of more or less conductivity. Zinc was the element most often used, and with its aid sound castings could be produced fairly easily with the minimum reduction of conductivity (as can be seen by referring to Matthiessen's and Addicks' data for wires quoted above). Of course, such castings deoxidized by zinc had a considerably lower conductivity than copper wire, running only about 40 to 50 per cent in many cases. The necessity of sacrificing conductivity for the sake of soundness in the case of copper castings sesms to have been recognized by electrical engineers, who designed the cast connections of important conductors with generous cross-sections to prevent heating. A better deoxidizer, which would give the same soundness obtained by zinc but without reducing the conductivity so much, is of course much to be desired, as it would allow a casting of less weight to carry with equal ease any given amount of current. To this end phosphorus and silicon have both been used in place of zinc, but while very small quantities of either are normally sufficient, their use is attended by the disadvantage that an excess of either of these elements does more harm to the con-

ductivity than an equal excess of zinc. This objection applies with more force to phosphorus than to silicon. Boron has lately been used with success as a deoxidizer pense because of the difficulty of reducing this element for copper, but its use is attended with considerable ex- to a form in which it is effective.

The problem of a superior deoxidizer for copper has received serious study in the experimental department of the Titanium Alloy Mfg. Co. for several years, with the result that a method of using silicon as a deoxidizer for copper has been found which makes the most of the superiority of this element over zinc, and at the same time minimizes the bad effect of the small excess of deoxidizer which cannot always be avoided. Of course, careful melting of the copper, to prevent as much oxidation or absorption of gas as possible, is an important part of this process. The first step, then, is to melt the metal quickly and in as non-oxidizing an atmosphere as possible, keeping it well covered with charcoal at all times. A small amount of silicon is added before pouring, in the form of a flux which we have developed and which acts in such a way that the excess of silicon and oxides of silicon are thrown out of the metal to the surface of the casting, leaving the interior pure and clean. In this way we have been able to make complicated and large sand-castings of pure copper having 75 to 85 per cent conductivity, as compared with the 40 to 50 per cent generally obtained on copper castings deoxidized by zinc. This material naturally is soft and weak, and so far we have found no way to harden it except by forging. But we are still working along these lines, and hope eventually to evolve an alloy which will make harder, stronger castings of equally good conductivity.

FIG. 1. PURE COPPER. FIG. 2. BADLY OXIDIZED COPPER. FIG. 3. OXIDIZED COPPER AT 400 DIA. FIG. 4. COPPER TREATED WITH PHOSPHORUS. FIG. 5. COPPER DEOXIDIZED BY ZINC.

A few photomicrographs are submitted herewith, to illustrate the structures of a few samples of copper made in different ways. These specimens were examined in connection with the research to develop a satisfactory deoxidizer for copper. Fig. 1 shows the structure of a small ingot of especially pure electrolytic copper magnified 100 diameters. A section of the metal was carefully polished to remove all but the finest scratches from the surface, which was then treated with a mixture of strong ammonia and hydrogen peroxide until it was rather deeply corroded. This etching reagent attacks the copper crystals with different intensities, so that some appear darker than others after etching. Impurities are shown either by dark streaks between the grains or by more or less regular markings within the grains. In this case there are no markings within the crystals, showing the absence of dissolved impurities, but there are dark streaks between the copper grains due to the presence of a little copper oxide. Fig. 2 shows a sample of copper which was carelessly melted and badly oxidized. An excessive amount of oxide is here indicated by the dark bands between and within the grains of pure copper. Fig. 3 is a view taken at a higher magnification (400 diameters) and before etching, of copper with abundance of oxide. The drop-like particles are blue copper-oxide, and the background in which they appear is pure copper. The clear areas of this view are thus the copper grains, and the spotted areas are what is known as a eutectic, or mixture, of copper and copper-oxide. It is this eutectic which is strongly attacked in etching, giving dark bands around the copper grains, and it is evident from this view that a very small amount of oxygen, present as tiny globules of Cu_2O, will form an appreciable amount of the eutectic, as was the case in the pure copper shown in Fig. 1.

FIG. 6. TURPENE CAST COPPER. FIG. 7. COPPER CONTAINING ARSENIC. FIG. 8. COPPER DEOXIDIZED WITH SILICON. FIG. 9. PUREST CAST COPPER. FIG. 10. SAME AS 9 HARDENED BY FORGING.

Fig. 4 shows a sample of copper treated with phosphorus, etched as explained above, and magnified 100 diameters. The copper grains are seen to have etched darker around their edges, showing the presence of phosphorus in solution, and there are streaks of oxides between the grains. Fig. 5 shows some copper deoxidized and hardened by about 4 per cent of zinc. This metal is sound and free from dirt or oxides, but the crystals show rows of light spots indicating an impurity (zinc) in solution. This view was magnified only 20 diameters.

Fig. 6, also magnified 20 diameters, shows some very impure cast copper, with traces of lead, tin and iron, as well as considerable zinc, and the unevenness of structure is very evident. Fig. 7 shows a similar impure sample containing a little arsenic, but magnified 100 diameters instead of 20.

Fig. 8 shows the structure of copper deoxidized with an excess of silicon, magnified 50 diameters.

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CONTENTS

AMERICAN INSTITUTE OF METALS

The Executive Board of the American Institute of Metals met in New York on February 18, 1918, and discussed very fully a proposed invitation to join the American Institute of Mining Engineers. At that meeting the board appointed a committee consisting of W. M. Corse, president; G. H. Clamer and N. K. B. Patch, past presidents, to confer with a similar committee from the American Institute of Mining Engineers, and work out the details of the proposition. This committee held a meeting on February 20, 1918, and their report was submitted to the Board of Directors of the American Instiute of Mining Engineers, on March 22, 1918. At this board meeting the formal invitation was approved. Both the executive board of the American Institute of Metals and the board of directors of the American Institute of Mining Engineers voted unanimously in favor of the proposed union.

Before the final acceptance of such an invitation, the executive board of the American Institute of Metals desired a referendum vote of the membership. This vote was taken by means of a reply post card canvass, and at a joint meeting of executive boards of the two societies, held on Saturday, April 26, the result was announced as being 168 in the affirmative, with 5 in the negative.

The following resumé sets forth the advantages of the union of the two societies:

First. The American Institute of Metals becomes a division of the American Institute of Mining Engineers, under Article XVII of its by-laws, to be known as the "Institute of Metals Division." It will elect its own officers, raise funds for its own special work and have active control of such funds. Cash in the treasury and moneys collected from the sale of back volumes of transactions will go to these funds. By such an arrangement the identity of the American Institute of Metals is retained.

Second. There will be two meetings a year instead of one as at present. The winter meeting will be held in February in New York, and the program will consist principally of technical papers. The fall meeting will be held as now, at the same time and place as the meeting of the American Foundrymen's Association. Its program will consist of papers on practical foundry topics and will probably combine with the iron and steel section of the American Institute of Mining Engineers, held at the same time.

Third. The secretary of the American Institute of Mining Engineers and the managing editor will take over the work of editing and publishing all papers accepted for the transactions. Both these men are salaried officers and have assistants to aid them in the carrying on of such work. The dues of the Institute of Metals

Division will be handled through the regular channels of the American Institute of Mining Engineers.

Fourth. The headquarters of the American Institute of Mining Engineers, in the Engineering Societies building, at 29 West 39th Street, New York City, will be the headquarters of the Institute of Metals Division. The members' privileges include the use of the United Engineering Library, members' room, and all other privileges extended to the members of the American Institute of Mining Engineers.

Fifth. The papers read before the Institute of Metals Division and other papers on allied subjects will be collected in a special volume of transactions. This volume and two others will be sent free to all members of the division. The other volumes contain papers on mining, including the mining of copper, zinc, lead, etc. In addition, a monthly bulletin is sent free to all members. This bulletin contains all the advance copies of papers and notices and items of general interest.

Sixth. The dues of the Institute of Metals Division will be the same as for the American Institute of Mining Engineers, viz., $12 a year. As the fiscal year of the American Institute of Metals starts July 1, 1918, a bill for one-half year's dues will be rendered at that time. The regular initiation fee of the American Institute of Mining Engineers will be remitted to American Institute of Metals members.

Seventh. The membership of the American Institute of Mining Engineers, according to Article II of the Constitution, comprises four classes, viz.:

1. Members.
2. Honorary members.
3. Associates.
4. Junior members.

The membership of the American Institute of Metals will fall principally into Classes 1 and 3. The main difference between the classes of members and associates is one of experience. Both classes are entitled to the privileges of membership, including the right to vote. All of the members of the American Institute of Metals will probably come into either of classes 1 and 3. It is proposed to send out a questionnaire to American Institute of Metals members, from which the American Institute of Mining Engineers' committee on membership will be able to determine the proper classification.

There is little to say in comment in the passing of the American Institute of Metals as an individual society. There is no doubt but that the activities of the American Institute of Metals and the American Institute of Mining Engineers have overlapped to a certain extent for some time. The mining of metals and their metallurgy are so closely allied that a line cannot be drawn between them so far as the technically educated man is concerned. With the practical foundryman, however, it seems to us there is a difference. His interest lies more in the problems connected with the foundry that arise in his daily work. As long as the sessions of the Institute of Metals division held with the American Foundrymen's Association continue to be of a practical nature, so long will his attention be held.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

A FOREIGN INQUIRY

For the past fifteen years THE METAL INDUSTRY has answered questions which included about every metal or plating subject under the sun. During this time we have replied to 2,566 firms and individuals who wished technical information, and we have answered some five thousand people who wished commercial information. To the best of our knowledge and belief these questions were answered satisfactorily to the questioners, but we must admit that at last we are stumped when the following question is put before us.

We have advised the party where he can get the shaving knife and hair cutting machine, but if any of our readers know of some one who will fulfill the last requirement we will be pleased to forward a photograph and particulars.

SWEDEN, Lulia den 14 Dec., 1917.

To the Editor of THE METAL INDUSTRY:

As I daily do read your language I hereby kindly ask if I through your office can buy or get address for:

1 realy good shaving knife to 25 or 30 shilling.

1 realy good hair cutting machine to above price.

1 lady photo about 20 year to get married with.

I reply to get an answer from you and remain to hear your subscription duty for 1918.

Certify:
Samartudernon
E. Yonsson.

HJALMAR LUNDMARK,
Post Box 50,
Lulia, Sweden.

NEW BOOKS

Eye Hazards in Industrial Occupations.—By Gordon L. Berry, Field Secretary, National Committee for the Prevention of Blindness, with the co-operation of Lieutenant Thomas P. Bradshaw, U. S. Army, formerly Technical Assistant to the Director of the American Museum of Safety. Size 6 to 9 inches. 150 pages. 50 illustrations. Published by the National Committee for the Prevention of Blindness, 130 East 22nd street, New York. Price 50 cents.

In this volume the author reviews the chief industrial hazards to eyesight in the industries of the United States. Case reports illustrate each section, the special dangers are described and recommendations made for such changes of working conditions, or installations of protective devices, as have been found suitable for protecting workers. The book is most completely illustrated.

The following section headings indicate the scope of the book: Statistics of Eye Accidents, Chipping Operations, Machine Operations, Abrasive Wheels, Sand-blasting, "Mushroomed" Tools, Riveting, Radiations from Intense Light and Heat Sources, Ultra-violet Rays in Illuminants, Radiant Energy in Arc Welding and in Molten Metal, Metallurgic Operations, Glassblowers' Cataract, Infections, Gage Glasses, Acids and Chemicals, Treatment of Acid Burns, Industrial Poisons, Removal of Dangerous Fumes, Vapors and Gases, Spray Process Hazards, Methyl Alcohol, Bottling Accidents, Mining and Quarrying, Agricultural Hazards, Goggles, Garment Trade Hazards, Industrial Lighting, and the Safety Movement.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—Will you kindly tell me how to alloy copper with iron?

A.—You will find it very difficult to alloy copper with iron in a proportion higher than 3 per cent. iron. If you can obtain temperatures sufficiently high to fuse the iron, melt thin soft iron bar and then add copper. If such high temperatures are not obtainable wrap soft iron binding wire round rod copper, and charge into crucible at highest obtainable temperature.—W. T. F. Problem 2,567.

CASTING

We have an inquiry, for manganese bronze castings, they being bodies for the support of two ball races (spherical design). Dimensions are, roughly, 5 ins. diameter, ⅝ in. thick, with central core through this about 2½ diameter through the sides. These must meet the following requirements: Maximum breaking load 30 tons, min. yield point 16 tons, elongation in 2 ins. 20 per cent. We would like particulars as to the process to be adopted in casting to ensure the tests being attained.

A.—The castings are to be made, presumably, from manganese bronze ingots as supplied by a specialist. In mixing this alloy the ingots should be melted in graphite pots under a flux of cryolite. The pouring temperature should be about 1100 degs. C. Skim-gates should be allowed to enter the mould tangentially and quietly. A heavy riser must be attached, as the better the feeding the freer will be the castings from yellow spots (shrinkage cavities). The runner should be of narrow section where the metal enters the mould, and the riser should be in communication with the outside air.

The whole secret lies in effective feeding from the riser, assuming the metal has been skimmed clear and carefully poured. The in-gate should be kept full of metal during pouring.—W. T. F. Problem 2,568.

COLORING

Q.—We have a large number of light cored aluminum castings weighing a few pounds to make, and should be glad if you could give us any information in regard to the best method of making sound castings with a really good surface. We think there is possibly some special facing sand that is found to give good results.

A.—We would recommend you to use fine floury silica facing sand and to apply a "blacking" of plumbago painted on in liquid form, and the mould subsequently skin-dried. Pea-flour also gives a good surface. It should be dusted on to sand of fine texture, very lightly rammed. To produce a still finer surface, when using a liquid blacking, a light sprinkling of dry plumbago should be applied to the surface, then sleeked.—W. T. F. Problem 2,569.

DRILLING

Q.—What is the correct speeds to use for drilling brass on a drill press with the regular carbon steel twist drills? Also advise if it is possible to increase production by using high speed steel drills?

A.—One of the largest manufacturers of twist drills became tired of having people use their drills at the wrong speed and then complaining that they did not give satisfactory results, so the concern compiled a table showing the speeds at which drills should be used.

For steel the speed is naturally slower than that for brass. The speed of a drill used on iron should be from 1,750 revolutions for 1/16 inch size up to 220 revolutions for ½ inch, 90 revolutions for 1 inch, 45 for 2 inches and 30 for 3 inches.

For brass the speed should be 2,000 revolutions for 1/16 inch, 375 revolutions for ½ inch, 145 for 1 inch and 100 for 1½ inch. For other sizes the speeds are in proportion.

You cannot increase your production by using high speed drills on brass and you will find that you will get just as good results by using carbon steel drills.—P. W. B. Problem 2,570.

FINISHING

Q.—We are interested in obtaining a formula or process for finishing such articles as steel chains and rings black for government requirements. The chain and rings are used on bits and saddles. The finish must be a deep black, which will not rub or easily wear off. Nothing is said about the finish being rust proof. We can, of course, plate the parts brass or copper before finishing them. Please note that the finish must be a deep black and it is essential that it be something as economical as possible to use or put on.

A.—At the recent conference at Washington, D. C., hearing upon the plating of metal articles for military purposes, it was decided that a black nickel finish was the most effective finish to deposit followed by lacquering in the ordinary manner. Steel articles should be copper or zinc plated before black nickel plating.

You do not state whether you are going to use still or mechanical tanks in your plating operations. However, we will give you a formula for a still solution and for mechanical purposes the proportions should be doubled:

	Water	1	gallon
1.	Double nickel salts	6	ounces
	Single nickel salts	2	ounces
	Sodium sulpho-cyanide	2	ounces
	Copper carbonate	½	ounce
2.	Carbonate of ammonia	1½	ounces

In preparing the solution dissolve No. 1 in three-fourths of the water or more, leaving about ⅛ of the amount to dissolve the ammonia and copper separately. Boiling water should be used for the purpose. On still tanks a voltage of ½ to 1 volt should be used and on mechanical solutions 3 to 4 volts. Use anodes of nickel. When the deposit becomes too gray in tone add a little more copper and sulpho-cyanide of sodium.—C. H. P. Problem 2,571.

FLUXING

Q.—Can you give us a formula for a non-corrosive flux suitable for tinning copper wire? At present we pass the wire through a bath of muriatic acid before passing it through the molten tin, and find when used in making cables the tinned wire turns black during vulcanization. We believe the trouble is caused by the flux used not being entirely cleared from the wire, and, if so, setting up action in conjunction with the sulphur in the rubber. We understand glycerine is sometimes used, but this is at present unobtainable; and we believe that the muriatic acid if killed with zinc can be made non-corrosive if beef fat is introduced at the time of "killing"—but this, again, is unprocurable.

A.—The muriatic acid should not be used alone, but should be mixed with saturated solution of sal-ammoniac in water (that is, as much sal-ammouniac as the water will dissolve). Then mix three parts of the solution with one part of muriatic. Beef suet is used only on the surface of the molten tin, which is known as the grease pot. Palm oil is the proper agent, but the wire must first be tinned in another pot covered with powdered sal-ammoniac. In this case there is no need of a second grease pot.—G. J. Problem 2,572.

GRINDING

Q.—We would like you to recommend to us the most economical and quick method of emery finishing the inside of cooking utensils.

A.—It would seem to us that the most economical method for emery finishing of the inside of cooking utensils would be to have chucks made to hold the utensile and then revolve them at a speed of 750 to 1,000 revolutions per minute and use emery cloth of the required grade to produce the finish desired.

You do not state what material the utensils are made of. If they are made of aluminum then the emery cloth would be best as it would leave the aluminum clean. If the articles are of steel the emery paper would also prove satisfactory, but if of cast iron it would be necessary to have the surfaces turned before applying the emery finish. There are mechanical methods, such as using felt wheels and tripoli with dry emery for such inside work, but the emery cloth is the simplest method to use.—C. H. P. Problem 2,573.

MACHINING

Q.—Can you inform us whether mercury has any action on cast iron if the cast iron has been machined? We are proposing to use it in turned cast-iron vessels, and are a little doubtful as to whether treatment of the cast-iron surface is necessary.

A.—Iron bottles are used for storing mercury, and it is a well-known fact that iron is a metal which enjoys immunity from the amalgamating influence of mercury. Treatment of the cast-iron surface would seem to be unnecessary, unless coslettising were resorted to. Iron and mercury do not amalgamate except under special conditions, such as adding sodium amalgam to a solution of iron sulphate.—W. T. P. Problem 2,574.

MELTING

Q.—We are making a mixture of 80 copper, 10 tin, 10 lead and 1 phosphorus. The castings we are making are quite heavy and we are having trouble with same. The castings are getting real spongy, and perhaps you can give me a remedy. We are heating our metal a certain degree, but before pouring chill it down with gates.

A.—You do not state how your melting is done, but it is probably in an open-flame furnace, as the difficulty of obtaining crucibles has led many brass founders to adopt this type of furnace. It is difficult to obtain uniform melting conditions in the open-flame furnace and oxidized sluggish metal is common, this condition resulting in spongy castings. Quick melting and the use of a cover of 2 parts of fluor-spar to 1 of lime will give a clean fluid metal that will also give sound castings if poured at a fair temperature. Your plan of cooling by means of gates will afford you a good estimate of the fluidity of your metal, but it should not be carried too far, as phosphor bronze sets very quickly and if poured at too low a temperature it may set, even in a heavy casting, before the occluded gases in the metal and the air in the mold can escape, so that spongy castings result. If poured too hot the metal cuts the mold and you obtain sandy castings that ruin the cutting tools used in machining them.—J. L. J. Problem 2,575.

Q.—Through inability to get a supply of coke we have been compelled to change our pit furnaces into fuel-oil furnaces. We have no difficulty in melting red and yellow brass, but in a mixture of bronze (83 copper, 12 tin, 1 lead and 4 zinc) we find it nearly impossible to get out our castings without being porous both inside and out. These are bushings averaging about 6 pounds, using 2½ inch core. If you can suggest a remedy for our trouble we would very greatly appreciate same.

A.—In melting in crucibles using oil fuel, especially in pit furnaces that have been changed over from coke, there is usually a much more intense heat around the top of the crucible than at the bottom. Hence, the melting is likely to be slow and the metal burned on the surface before it is thoroughly melted. By keeping the metal well covered with charcoal and using a combustion chamber, so that the whole furnace is filled with flame, better melting conditions are obtained. Trouble may then be had, however, with cutting away of the pedestal upon which the crucible rests. Introduction of the oil flame into the furnace tangentially, so that the crucible is surrounded by a swirling flame, will give the best results.

The reason why the mixture you name is more difficult to handle than red or yellow brass is because of its high tin content. When the tin oxidizes it makes the metal sluggish and drossy, while the tin oxide itself is reduced only at a very high temperature (about 2,500 degrees Fahr.) and in the presence of reducing agents.—J. L. J. Problem 2,576.

PLATING

Q.—Will you inform me if it is possible to use 1-inch solid brass bar for the anode and work pole in my tanks?

A.—The electrical conductivity of pure copper and brass, which we presume to be 65 copper and 35 spelter, is 97.61 for the copper and 21.50 for the brass. This is practically four to one, so if you wish to use the brass conductors you would have to have them four times as thick as you would for pure copper in order to convey the same amount of electricity to the tank. In other words the 1-inch solid brass bar will carry the same amount of electricity as a copper rod only a quarter of an inch in diameter. Moreover, the brass rod will corrode under the influence of the vapors and gases in the plating room more quickly than copper. These are the reasons why copper rods are used.—K. Problem 2,577.

POLISHING

Q.—I am desirous of obtaining some information on barrel polishing small castings which are on a household scale.

A.—You do not state the composition of the castings you wish to polish by the barrel method. If the castings have small burrs or fins upon them then the following methods should be followed:

First, tumble in sea sand or small chippings from sand stone, add water and a small amount of washing soda, about one to two ounces per gallon of water. Second, after the burrs have been removed tumble wet or dry. If the wet method is used the solution for tumbling should be composed of

Water	1 gallon
Washing soda	4 ounces
Sodium cyanide	1 ounce

From this solution the castings can be plated direct. If a dry method is used then procure some scraps of sole leather and tumble with the material until a bright lustre is produced.

Ball burnishing can also be used either wet or dry after the preliminary tumbling as suggested.—C. H. P. Problem 2,578.

TUMBLING

Q.—Could you furnish me with some information in reference to the proper speed of a tumbling barrel used for plating, also the density of a copper and zinc solution for plating barrels?

A.—Tumbling or mechanical barrels when used for plating should be run at from two to four revolutions per minute. Zinc plating requires the minimum speed and copper may be done at five revolutions per minute, but the slower the speed the better the deposit.

The density of a solution depends upon the metal content for effectiveness. If the solutions are prepared from the cyanides of the metals they should contain not less than 4 ounces of metal per gallon of water, but for heavy deposits 5 to 6 ounces should be used.

The following proportions for copper solution will give some idea of a solution containing close to 5 ounces of metal per gallon. The density of a solution means nothing unless it contains metal in proportion to its density.

Water	1	gallon
Sodium cyanide	8½	ounces
Copper cyanide (70% metal)	7	ounces
Soda ash 58%	4	ounces
Caustic soda 76%	¾	ounce
Hyposulphite of soda	¼	ounce

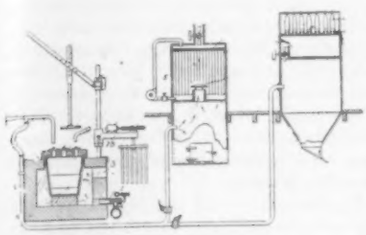
The density of this solution Baumé would approximate 12 to 14 degrees.—C. H. P. Problem 2,579.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,260,312. March 26, 1918. **Process of Recovering Metal from Scrap Material.** John W. Brown, Lakewood, Ohio.

This invention relates to a process for the recovery of metals from scrap material containing the metal sought. The object of the invention is to provide a process which will obviate certain difficulties and objections inherent in present methods employed, and further a process which will recover the metal in such form as to be commercially usable and profitable of recovery.



As illustrating one form of apparatus with which my process may be carried out, reference should be had to the accompanying drawings in which the apparatus is diagrammatically illustrated in elevation.

The recovery from scrap material, such as borings, filings, turnings, clippings, punchings, sawings, etc., of certain metals and their alloys such as zinc, aluminum, etc., has been attempted by melting the scrap in a crucible, raking or stirring the mass to separate the metal therefrom and usually adding a flux to the dross material for the purpose of recovering further amounts of metal.

In some cases, the flux or portions thereof may be volatile, which represents a loss of material, as well as causing fumes which are obnoxious and in a measure harmful to the workmen manipulating the process.

In this process, the disadvantages above enumerated are very largely eliminated and reduced to a minimum, and the yield of metal is in excess of the yield obtained by usual methods.

1,260,661. March 26, 1918. **Method of Recovering Metals from Thin Alloys.** Julius H. Gillis, of Toronto, Canada, assignor to British America Nickel Corporation, Limited, of Toronto, Ontario, Canada, a corporation of Canada.

This invention is an electrolytic method whereby a metal may be recovered in a state of substantial or commercial purity from its alloys.

Nickel-copper alloys wherein nickel predominates are readily obtainable by smelting the appropriate ores. As an illustration of this invention, there is cast into any convenient anode form an alloy containing for example about two parts of nickel by weight for each part of copper. This anode is suspended in a suitable electrolyte, for example a weak solution of nickel sulfate, together with a cathode of sheet nickel, iron or other appropriate material. If now the electric current be caused to flow from the anode to the cathode through the electrolyte, as under the usual conditions for electro-depositing metals, it will be observed that for a short period of time the cathode deposit will consist of pure nickel. During this same period both nickel and copper will pass into solution at the anode, the nickel in predominating proportion. This is due in part to the fact that nickel predominates in the composition of the anode, and in part to what may for convenience be termed the "selective effect" of the current, under the influence of which nickel tends to dissolve more rapidly than coppr. If the electrolysis be continued under these conditiones, copper will begin to separate at the cathode.

1,260,740. March 26, 1918. **Treatment of Iron and Steel to Prevent Corrosion.** Wm. H. Allen, Detroit, Mich.

This invention relates to the treatment of articles of iron or steel whose surfaces have been treated to change them from metallic iron to phosphates of iron; and its object is a process whereby such portions of the surfaces, which, by reason of improper or ineffective actions of the compounds of phosphorus employed to produce such surfaces are not rendered non-corrodible under the actions of the elements, may be rendered inactive under such conditions.

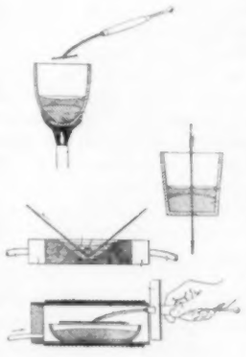
The patent covers:

The method of preventing the rusting of surfaces of articles of iron and steel which have been changed in part to phosphates of iron, which consists in immersing such articles in a solution of ferrocyanid of potassium.

The method of preventing the rusting of surfaces of articles of iron and steel which have been changed in part to phosphates of iron which consists in immersing such articles in an aqueous solution of a double cyanid of iron and an alkaline earth metal.

1,261,110. April 2, 1918. **Process of Coating Tungsten or Molybdenum Articles with Precious Metals.** Frank A. Fahrenwald, of Cleveland, Ohio, dedicated, by Mesne assignments, to the Government of the United States of America and to the people of the United States of America.

This application is made under the act of March 3, 1883, chapter 143 (22 Stat., 625) and the invention herein described and claimed may be used by the Government of the United States or its officers or employees in the prosecution of work for the Government or any person in the United States without the payment of any royalty thereon.



This invention relates to a metal body consisting of tungsten, molybdenum, or other oxidizable metal, and a layer of precious or non-oxidizable metal intimately connected therewith so as to permit the soldering, or brazing of the article, or other high temperature working thereof without the occurrence of oxidation.

The patent covers:

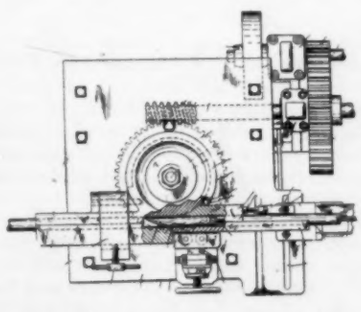
The process of coating ductile tungsten with gold which consists in first immersing said tungsten in a bath as shown in cut, containing the fused exygen salt of an alkali metal, and, second, immersing said article for not more than about 30 seconds in a bath containing principally or entirely molten gold a temperature of not more than about 1350° C.

The process of coating tungsten or molybdenum wires with a non-oxidizable metallic coating such as gold, silver, platinum or palladium, which consists in drawing said wires first through a bath containing the molten oxygen salt of an alkali metal and thereafter through a bath of the molten coating metal maintained at a temperature not higher than about 1400° C.

The process of treating tungsten or molybdenum, comprising using as a flux a mixture consisting of or containing the oxygen salt of an alkali metal substantially as specified.

1,261,191. April 2, 1918. **Tube-Bending Machine.** Charles Vallone, of Buffalo, New York, assignor to the Dollar Saving & Trust Company, of Youngstown, Ohio, a corporation of Ohio.

This invention relates to machinery for bending tubing and more especially for the bending of metal pipes or tubes, of diverse cross-sectional configuration. The principal object of the invention is to provide machinery for bending tubing without flattening, cracking, breaking, creasing or otherwise disfiguring the tubing in the process of the bending operation.



The walls of the tubing are sometimes pulled apart during the bending, owing to the stretching of the metal over the mandrel or other bending apparatus employed. The metal begins to stretch at one or more

places, and as it stretches, weakens, thereby inviting more stretching at that point, and parting, breaks there.

It has always been necessary, where the tubes are used for fine work, to perform other operations on the tubing after the bending operation is over, in order to eliminate these disfigurations.

By this invention it is possible to produce a machine, as shown in cut, which draws the metal out, fairly evenly distributing the strain and the stretching thereof, where there is stretching and the upsetting, where there is upsetting.

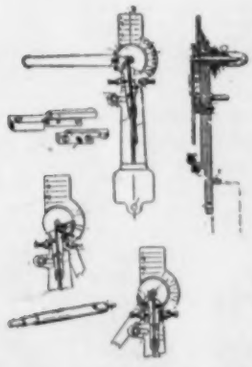
1,261,209. April 2, 1918. **Soldering Compound.** Charles E. Bonike, Melrose Park, Pennsylvania, assignor to Henry Hess, Philadelphia, Pa.

This invention relates to a soldering compound or mixture in the form of a pasty mass, containing the necessary soldering materials, such as solder metal and a flux, which mixture may be conveniently applied without waste to the parts to be joined, and which may be melted by the application of a moderate degree of heat.

In the improved soldering compound, the solder metal is in finely divided or powdered condition, the flux is preferably in the form of ammonium chlorid, the binding material is in the form of glue, preferably mixed with a proper proportion of glycerin to produce a glue mixture, and the vehicle to give the proper consistence to the mass, is preferably in the form of glycerin, which latter substance may be present in greater or less quantities according to the consistence the mixture is to possess. Further it has been found that a mixture of such ingredients will give the most satisfactory results if, at a certain stage in its preparation, it is subjected to a baking operation.

1,261,550. April 2, 1918. **Wire-Bending Device.** Melvin D. Kilmer, Cleveland, Ohio.

This invention relates to devices for bending wire, its object being to provide a device of this character which will be simple and economical in structure, efficient in operation and lend itself to the making of an unlimited number of accurate forms from wire and other material.



The annexed drawing and the following description set forth in detail certain means embodying the invention, the disclosed means, however, constituting but one of various mechanical forms in which the principle of the invention may be employed.

The machine is described as follows:

In a wire bending device, the combination of a main frame member formed with a circular depression and a bore coaxial therewith, a rotatory member having a cylindrical stem mounted in said bore and formed with an enlarged cylindrical portion mounted in said depression; a central pin projecting from said cylindrical portion; a second pin mounted adjacently to said central pin; a handle secured to said stem; and oscillatorily mounted guiding means on said frame which are adjustable for receiving wires of varying sizes.

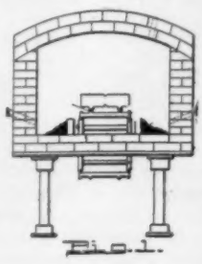
1,261,606. April 2, 1918. **Scaling and Annealing of Metal Articles.** Frank Perry, London, England.

This invention relates to the treatment of Mond or other producer or like gas for use in annealing metal articles or reducing or preventing the formation of non-metallic surfaces such as coatings of oxid on such articles when subjected to the heat of a muffle or the like.

The present invention consists in removing the saturated hydrocarbons such as methane in addition to such deleterious constituents as excess water vapor, sulfur compounds and unsaturated hydrocarbons all these constituents being removed before the gas enters the muffle.

1,262,057. April 9, 1918. **Sodium Cyanide Briquets.** Alfonse Kaufman, of New York, N. Y., assignor, by Mesne assignments, to Air Reduction Company, Incorporated, a corporation of New York.

This invention relates to articles of manufacture composed of loose or granular material put in the form of briquets, or blocks, and it also relates to methods of manufacturing, as shown in cut, such briquets, or blocks, from loose material, and has particular relation to methods and briquets, or blocks, involving a cyanid composition, as sodium cyanid.



One of the objects of the invention is to provide a cyanid composition, such as sodium cyanid, in a condition suitable for convenient transportation, manipulation, and marketing generally, which condition will be such that it will not be materially deleteriously affected by exposure to the atmosphere, and yet will be such that it may be efficiently directly utilized in its chemical relations.

Another object of the invention is the provision of an efficient method of forming cyanid briquets having the features of utility just mentioned.

1,262,062. April 9, 1918. **Method of Utilizing Aluminum Skimmings and Analogous Material.** James Wright Lawrie, of Milwaukee, Wisconsin, assignor, by Mesne assignments, to William F. Jebbins, Incorporated, of Aurora, Illinois, a corporation of Illinois.

This invention relates to a process of treating aluminum skimmings, screenings, dross, slags or analogous aluminous materials for the purpose of producing therefrom certain valuable and useful products.

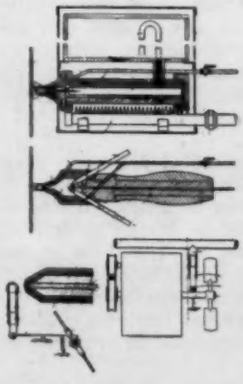
The patent covers:

The method of utilizing aluminum skimmings, slags, dross or analogous waste aluminous materials, which consists in treating the waste materials to form an aluminate solution, precipitating the zinc, copper and other impurities from the aluminate solution, and separating the solution from the solids, consisting in part of compounds of copper, of zinc and of iron or any of them.

The method of utilizing aluminum skimmings, slags, dross or analogous waste aluminous materials, which consists in treating the waste materials with a solution of alkaline caustic, precipitating the zinc, copper and other impurities from the aluminate solution, and separating the solution from the solids, consisting in part of compounds of copper, of zinc and of iron or any of them.

1,262,134. April 9, 1918. **Apparatus for Making Metallic Coatings.** Georg Stölle, Kiel, Germany.

In British Patent No. 23289/1913 a process for making metal coatings by means of a compressed gaseous medium is described, in which the metals in a wholly or partially volatilized condition are blown against the article to be coated. The object of the volatilization is to obtain such a fine distribution of the metal as cannot be obtained by the spraying method with any other means, and also to utilize the kinetic energy of the vapor in order to produce a brazing or welding of the metal particles with one another and with the foundation.



Now this invention has for its object an apparatus, as shown in cut, for practising a further development of this process with the object of substantially lowering the point at which the molten metal volatilizes, and enabling coatings to be made on easily inflammable articles or articles which suffer by the action of heat.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

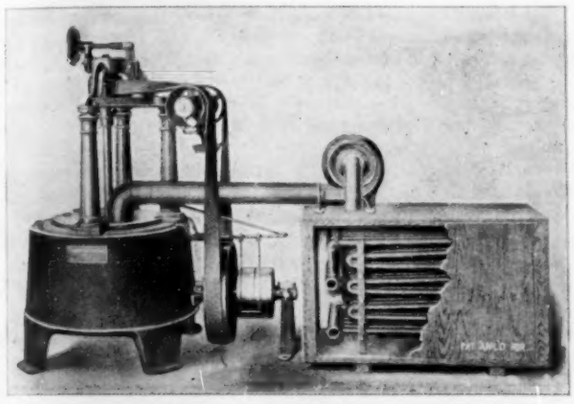
IMPROVED METHOD OF DRYING SMALL METAL PARTS WITHOUT THE USE OF SAWDUST AND THE TUMBLING BARREL

By Howard G. Winne.

In describing this method of drying small metal parts without the use of the sawdust tumbling barrel, many of our readers will recognize the great saving in time and consequent lowering of manufacturing costs.

After a long period of tests and experiments a new method of drying small metal parts was introduced in 1908, by the Tolhurst Machine Works, of Troy, N. Y.

By this process or method the result obtained is the simultaneous drying out and polishing of small metal pieces such as eyelets, pins, buttons, rivets, hooks and eyes, clasps and numerous other similar articles, and at the same time greatly reducing the time factor and eliminating the disadvantages which arise from the use of sawdust.



THE TOLHURST DRYER FOR SMALL PARTS.

Since the introduction of this method in 1908 a large number of equipments have been installed for use on a wide variety of articles, including coins for the United States and Canadian Governments, and the performances of these machines have been so uniformly successful that there is now no longer any doubt as to its superiority over the old-fashioned process of drying and polishing.

THE EQUIPMENT

The equipment necessary for this improved method is a centrifugal and chamber containing steam coil together with a blower. In the Tolhurst Metal Dryer all this is furnished complete.

It is important that the centrifugal be well any substantially constructed so as to take care of any unevenness in loading because of the high speed at which the basket revolves when in operation. For instance, it is difficult to fill the basket of a centrifugal with buttons, buckles, etc., in such a manner that the load is exactly and accurately distributed. The result is that in certain types of centrifugals, violent vibration occurs when the machine is operated. This is sometimes partially and temporarily overcome by the use of rubber cushions or springs. This, however, is an unsatisfactory way, as such devices are short-lived and unsafe.

The Tolhurst Centrifugal is self-balancing and vibrations are self-absorbed. This is accomplished by an unique arrangement of a movable bearing entirely controlled by the force of gravity. This machine is entirely safe and dependable, having a wide reputation not only in the metal drying field but in the textile and chemical field. Its efficiency and value are thoroughly demonstrated as it is in use in some of the largest plants manufacturing metal goods.

OPERATION

Articles to be dried are placed in the centrifugal and the machine started. The chamber containing the steam coil is also connected with the centrifugal basket by a large pipe through which a fan type blower forces the heated air into the centrifugal basket.

In a few minutes the metal parts are properly dried and so rapidly as to reduce tarnishing and oxidizing to a minimum. It is thus supplanting the tumbling barrel. Nothing else is necessary.

From five to seven minutes is all that is usually required to dry and polish a single load in the Tolhurst Metal Dryer.

Think what a saving this means. The elimination of sawdust, tumbling, cleaning, drying out, and polishing.

Tolhurst Metal Dryer equipments are complete, including centrifugal machine, blower, steam coil and chamber and connections,—all in correct size and capacity in relation to each other. Machines are made in sizes from 12″ to 32″ diameter. The 12″, 16″, and 20″ sizes having removable baskets while the larger sizes are arranged with bottom discharge feature, permitting the rapid unloading of the basket.

This improved method of drying and polishing small metal parts has met with pronounced success and favorable endorsement throughout the metal field. It is unquestionably a great time-saving, cost-reducing, trouble-eliminating method.

AN AMERICAN BRONZE POWDER WORKS

By consent of the United States Government and order of the Supreme Court the alien enemy bronze powder factory of B. Ullmann & Co., Inc., located at Closter, N. J., has been sold and transferred to Henry H. Mandle and M. A. Harwick, who have organized a new company under the firm name of National Bronze & Chemical Works, with main offices at 220 West 42d street, New York City.

It is a source of great satisfaction at this time to know that, while heretofore bronze powder factories have been usually foreign-owned, the new enterprise is distinctly American in management and ownership. Why should this not be so, when we have in this country the metals and all the materials needed for the most diverse and complicated processes, as well as the mechanical skill and executive ability to transform them into finished product?

M. A. Harwick, president of the Harwick Bronze Powder Company. who has had 18 years' experience in the manufacture and sale of bronze powder, will act as general manager.

Henry H. Mandle, metallurgist and consulting chemical engineer, will direct the manufacturing end of the works.

The new organization plan certain refinements and improvements in the manufacture of bronze powders that will make this product unique and give it peculiar value as to smoothness, brilliancy and covering power. These are matters which the average user of bronze powder does not sufficiently consider in his indiscriminate purchasing. He frequently lacks a clear conception of the real purposes for which the material may be intended; mere weight, bulk and price may, therefore, be the least essential things upon which to base a judgment as to the real worth of a powder.

The new National Bronze Powder plant at Closter, N. J., is a model of its kind. It was erected only a year ago and contains all the modern equipment necessary to produce high-class bronze powder under the most advantageous conditions. In mechanical arrangement, layout and architectural beauty it is as near perfect as a complete knowledge of the business and a liberal expenditure of funds could make it. The machinery and mechanical equipment are now undergoing thorough overhauling and will be put in first-class running order for immediate resumption of manufacturing activities.

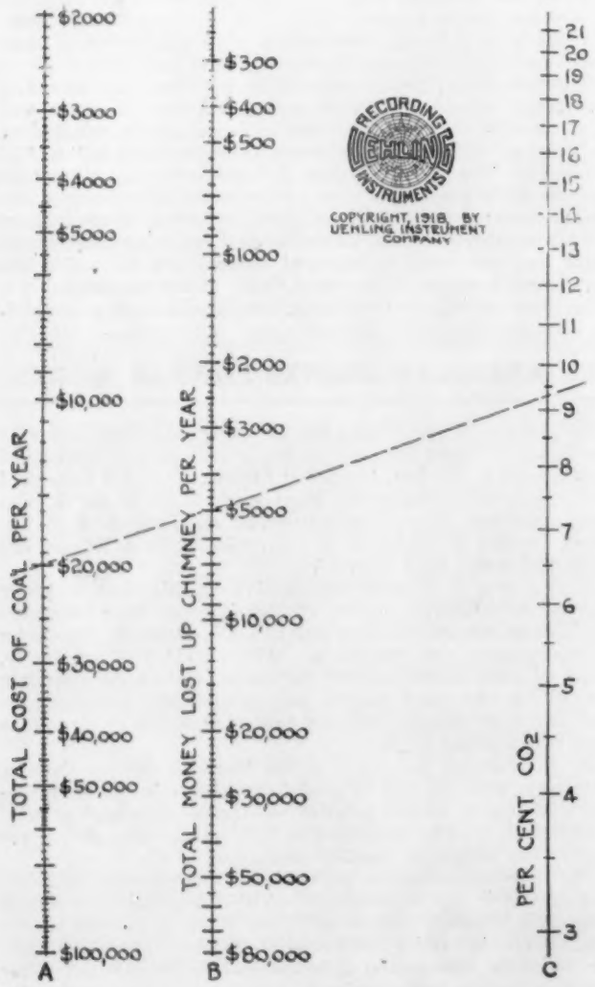
CHART FOR CHIMNEY LOSS

This handy and useful chart has been developed by the Uehling Instrument Company, 71 Broadway, New York. It is of unusual interest and value at the present time when the coal problem is so important, for it enables anyone to quickly and closely estimate the money now being lost up almost any chimney due to low CO_2.

Simply connect the percentage of CO_2 (shown in Column C) with the money now being spent per year for coal (shown in Column A) and the intersection of the connecting line with Column B immediately gives the dollars rolling out of the chimney in the form of heated gases.

Example: If $20,000 is spent per year for coal burned in a furnace whose average CO_2 registerers 9.3 per cent, what is the approximate money lost up the chimney per year?

Solution: Connect the $20,000 (Column A) with the 9.3 per cent. (Column C), as indicated by the dotted line drawn across



THE CHIMNEY LOSS CHART.

this chart, and the intersection with Column B shows the approximate yearly loss to be $5,000.

The object of this chart is to show that a high percentage of CO_2 is most desirable. To be sure, even where the CO_2 is as high as 21 per cent., the theoretical maximum, there is a loss because in the average power plant the flue gases leaving the boiler have a temperature as high as 500 or 600 degrees Fahr. Loss therefore is inevitable unless a blower is used for exhausting the gases and some sort of interchange system is installed for either heating the feed water or preheating air and leading it under the grate.

It is well to know all about these various things and the Uehling Instrument Company advises that its engineers will gladly co-operate in whatever way possible with responsible concerns to secure maximum returns from every dollar invested in coal. Being combustion specialists, the advice of the Uehling people will be of particular value in showing how to attain the highest possible percentage of CO_2. It should be borne in mind that combustion is a chemical process and for that reason should be studied from the viewpoint of the chemist.

It is significant that most of the large power plants of today have adopted CO_2 instruments that record automatically and continuously. The reason for this is to keep constant tab on the workers in the boiler room and the efficiency of combustion. The recorder may be placed at any convenient distance from the boiler in the office of the chief engineer, owner, manager or superintendent, while an auxiliary CO_2 indicator is placed on the boiler front in full view of the fireman. The function of the indicator is to keep the fireman constantly informed as to the efficiency of his own work. This feature is most commendable.

Coal cannot be saved by a CO_2 machine alone. If no attention is paid to the indicator or recorder, the installation of such apparatus borders on foolishness. The records should be carefully watched and studied and adjustments should constantly be made in firing methods until the best percentage of CO_2 is obtained. After the best mark is reached, fluctuation of the CO_2 line below that mark to any great extent should not be allowed.

This chart is based on a flue gas temperature of 600 degrees Fahr., and an outside air temperature of 60 degrees Fahr. Where the flue gas temperature is higher, or the outside air temperature lower, the money loss will be correspondingly increased. On the other hand, with a higher outside air temperature and a lower flue gas temperature, the money loss is proportionately decreased. Further, in the construction of this chart, it has been assumed that the coal has a calorific value of 14,500 B. t. u. per lb. of combustible.

It may also be interesting to point out that where there is only 3 per cent. of CO_2 in the flue gases, 76 per cent. of the heat value of the coal passes up the chimney as waste under the conditions outlined above. It is impossible, however, for these gases to contain as low as 2 per cent., because it would require more than the original quantity of heat in the coal to heat the enormous surplus of air to a temperature of 600 degrees Fahr.

LACQUERS AND ENAMELS

"There is much fanciful literature available upon the subject of lacquer, but the lack of practical information and the misinformation occurring among users of lacquer is, in the estimation of the writer, sufficient reason for the following remarks."

So wrote Frank P. Davis in an article entitled "The Production and Treatment of Lacquer," in the October, 1912, number of THE METAL INDUSTRY. Mr. Davis then gave us a valuable account of the various lacquers suitable for coating metals and describes various finishers which are obtainable by using lacquers.

"Some Practical Suggestions Regarding Lacquering," by W. A. Jones, was the title of an article published in THE METAL INDUSTRY in October, 1909, and related to the lacquering of wet work.

Both authors understood their subject thoroughly, and what they wrote was of particular aid to the user of lacquers.

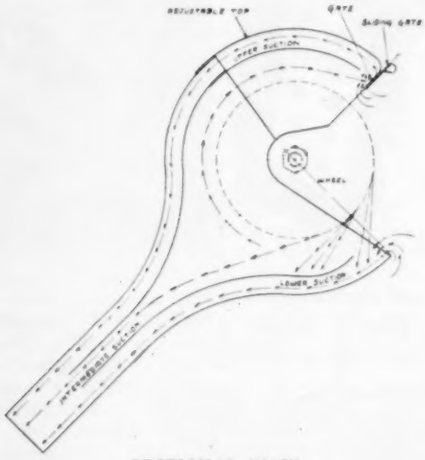
In mentioning these special manuscripts in our Equipment Department, we do so for the reason of indicating two of the useful articles that THE METAL INDUSTRY has published on the subpect, and which were strictly technical information and did not relate to the commercial end of the business, viz., the marketing of lacquers.

Coming to the latter subject of makers of metal coatings, the United States Lacquer Company of 444 Driggs Avenue, Brooklyn, N. Y., announce that their Resistol Lacquers and Enamels are a practical product, and ask that every user of these supplies let them submit samples free of charge. The Resistol Lacquers are made for spray, dip or brush work on all metals, and Resistol Enamels are made in white, ivory and black. The makers claim that they are unform, show a fine lustre and produce a hard resistant surface, and they ask for an honest trial. The company have a large plant and further particulars may be had by writing to them at 444 Driggs Avenue, Brooklyn, N. Y., and asking for pamphlet "Resistol."

DIVIDED SUCTION BLOWER HOOD

Figures 1 and 2 show what is known as the divided suction blower hood manufactured by Kemp and Bilicki, of Milwaukee, Wis. The manufacturers of this hood describe its operation as follows: Scientific divisions as shown in the cut of the hood create a forced draft on the outside, thus, it is claimed, making it impossible for any dust to escape from the hood regardless of the speed of the wheel.

A wheel running between these divided suctions loses its power of creating a counter current of air to carry a large



SECTIONAL VIEW.

per cent of dust out of the hood again, as is done in some of the old systems. This counter current is broken at three points making it impossible to throw any dust away from the hood at the working point of the wheel.

The manufacturers state that they have proved that the current of air created by the revolution of the wheel works in conjunction with the divided suction to create a forced draft outside of the hood, making it an absolute fact that

Pat. March 7, 1916.

SHOWING HOOD OPEN FOR TAKING OFF AND PUTTING ON WHEELS.

there is a strong current of air entering the hood at all points, top, bottom and sides. It is claimed that the divided suction blower hood is most economical and does more with less suction than the old style systems as it does not depend on a cyclonic effect at any one point, but gives a gentle divided suction aided by the wheel.

These hoods are designed for polishing, buffing and grinding stands and can be made to conform to the needs of any dust producing industry. Further information will be furnished upon request.

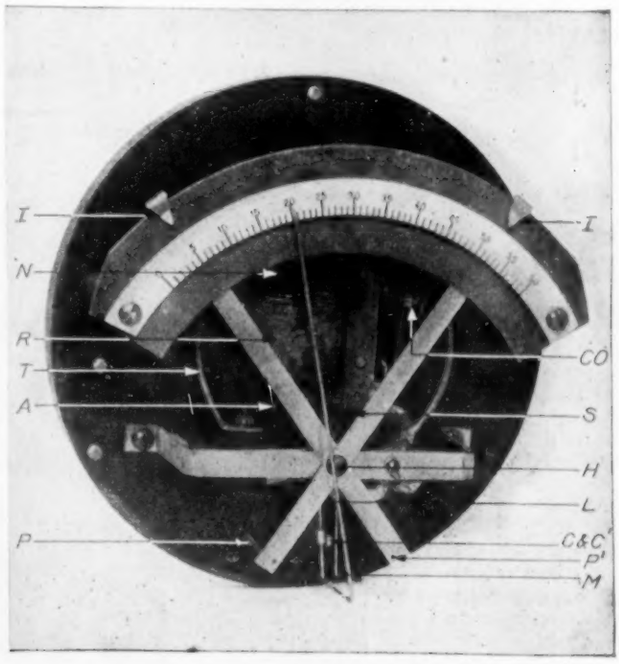
A NEW PRESSURE GOVERNOR FOR GAS AND LIQUID SYSTEMS

In many power installations, where air or other gases or liquids must be maintained under pressure, the demand for an automatic method of doing this has arisen.

As a result the General Electric Company has developed a new pressure governor to control standard self-starters for motor operated pumps and compressors. The governor maintains a pressure between predetermined limits on any gas or liquid systems that will not corrode the Bourdon tube.

This governor is called the OR 2922 and can be used on any standard a. c. or d. c. circuit. It is rated for pressures of 80, 100, 160, 300 or 500 pounds and operates within settings of from 3 to 12 pounds between high and low pressures. Governors for higher pressures can be supplied if desired.

The governor consists of a Bourdon tube, an indicating needle, a graduated pressure scale, adjustable high and low pressure stops to determine the desired pressure range and a relay which actuates the contacts in the control circuit of the self-starter, all enclosed within a dust-proof case, easily opened for inspection.



NEW PRESSURE GOVERNOR FOR GAS AND LIQUIDS.

Action of the governor is dependent on the Bourdon Tube which should be connected to an independent discharge pipe from the pressure tank. The free end of the tube "T" (photo 317984) is mechanically connected to the indicator needle "N" moving it over the scale as changes of pressure affect the tube.

After the settings for the pressure range have been made, the governor will automatically maintain pressure within those limits. The operation of the pressure governor is as follows:

Assuming that the pressure is at the low value, as indicated by the left-hand indicator (I), the contact (C) on the needle (N) completes the circuits through the contact (C^1) on the movable arm (M), which at the low pressure point rests against the stop (P^1). When this contact is made, the circuit is completed through the relay coil (R), causing the armature (A) to close. Attached to this is the contact (CO) which, upon closing, completes the control circuit to the self-starter, causing the motor to start.

The armature is also attached to the spring (S) which holds the contact (C^1) firmly against (C) until contact is broken at (P).

METAL MEN IN THE SERVICE OF THE ALLIES—SERIES 5

THE HONOR PAGE

PRIVATE ALFRED W. SMART.

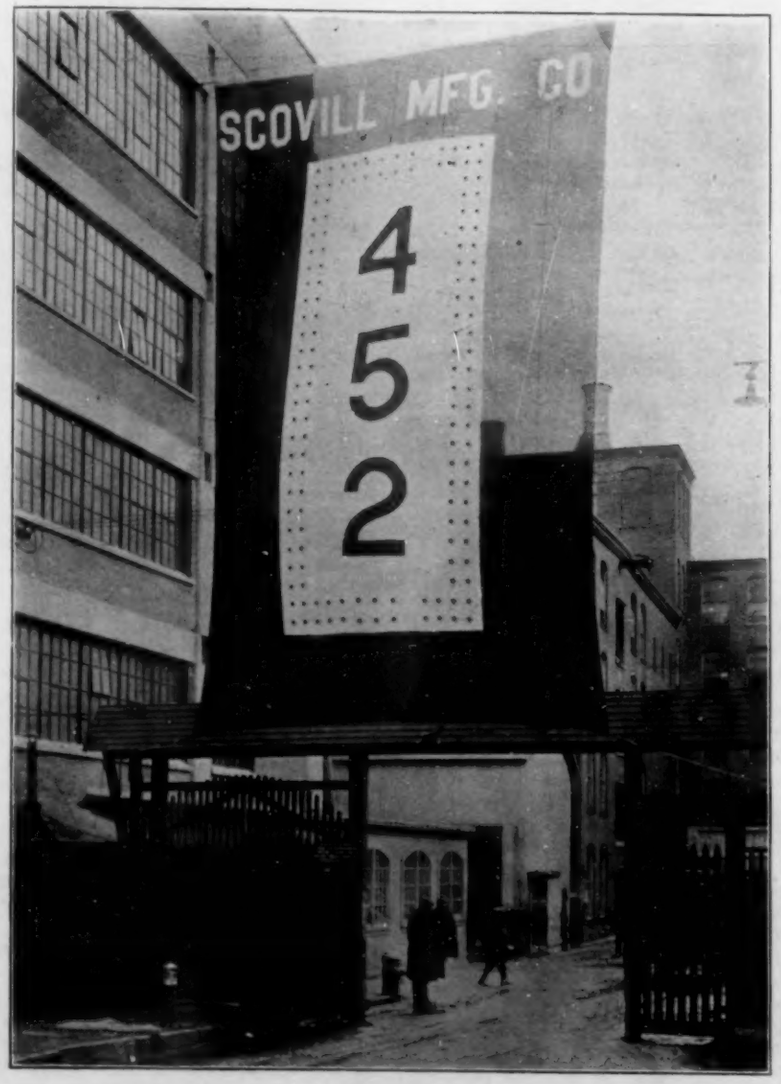
PRIVATE ARTHUR W. WHITE.

The Metal Industry invites anyone connected with the metal trades who is in or has friends in the service to send in photograph and story of career.

Alfred W. Smart vice-president of the Eureka Pneumatic Spray Company, Inc., 62-64 Ninth avenue, New York City, is among those patriotic citizens of this country who has gone abroad in the defense of democracy, and he is now somewhere in Europe.

Mr. Smart is a son of Walter J. Smart, the originator of the spray machine and spraying systems, and has for nearly three years been serving as an enlisted man in the 4th Company, C. D. C., Brooklyn, N. Y., taking his father's place after his father had served considerable beyond his time, and taken a full and honorable discharge. Mr. Smart has been eight months in training camp, and cheerfully responded to the call of his country, feeling fit to do his bit. His interest in military matters has only been second to the spraying industry, in which from the time he was a school boy he spent his Saturdays learning the business.

As a testimonial to the young man and other employees of the concern who are now serving abroad, the Eureka Pneumatic Spray Company, Inc., pledged themselves to devote 10 per cent of the receipts of the month of April to the purchase of Liberty Bonds.



SERVICE FLAG OF SCOVILL MANUFACTURING COMPANY, WATERBURY, CONN., SHOWING THAT 452 METAL WORKERS ARE IN THE SERVICE.

Arthur W. White was born in Dubuque, Iowa, December 24, 1899 and obtained his early education in Rock Island, Ill., and then became an electro-plater for the Rock Island Manufacturing Company. Becoming very interested in his work and finding it necessary to know about the principles of chemistry connected with electro-plating, he first took a course in the International Correspondence School, but finally his ambition led him to stop work and return to the school room.

He was just finishing his third term at school, when he enlisted in the Feld Artillery at Davenport, Iowa on the second of January, 1918. His first experience in military training was received at Jefferson Barracks, Missouri and from there he was transferred to Fort Bliss, Texas.

Private White is terribly in earnest and considers army life as just the right thing for the younger generation and he declares he has become a big booster for military training and could not be induced to exchange what he has seen and learned so far in the army for anything in private life. He is now attached to Battery F, 82nd Field Artillery, Fort Bliss, Texas.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

NATIONAL FOREIGN TRADE COUNCIL

An event of more than ordinary interest to all members of the business world, and to those engaged in the metal industries in particular, was the fifth annual convention of the National Foreign Trade Council, held in Cincinnati on April 18, 19 and 20, with President James A. Farrell, of the United States Steel Corporation, presiding as chairman, and in the neighborhood of 1,400 of the leading business men of the country, including many prominent metal and machinery men, attending. One of the leading addresses delivered, being one of a group of nine reports delivered on the opening day, dealing with the work of a similar number of fundamental industries and business activities in connection with the war, was on metals and was handled by E. A. S. Clarke, president of the Lackawanna Steel Company; and while it dealt principally with iron and steel, as the speaker's greater familiarity with those industries would indicate, he paid due tribute to the part of other metals in winning the war, saying:

"Among the many factors essential to success in modern warfare, perhaps the most important is an adequate supply of metals. In the present European conflict the daily consumption of metals, in various forms, has reached amounts so enormous and so much in excess of any previous figures that unless an adequate, constant and continuous supply is available to us and to our Allies, the bravery and devotion of our men will be without avail and victory impossible. There is no item among the long list of munitions and supplies necessary to prosecuting the war that does not involve the use of metals in some form as a necessary part. Men are, of course, the first essential; but to be effective they must be supplied with arms, ammunition, food, clothing and transportation, each of which, in turn, is dependent on an adequate supply of one or more of the various metals, even the rarest. This war is, truly, an economic war, from this point of view as well as from others. Fortunately for us, as well as for our Allies, we possessed, even at the outbreak of the war in 1914, ample developed sources of supply of those metals most needed and in the largest quantity, viz., iron, steel, copper, lead, zinc, gold and silver; while our Allies or the other neutral nations had similar sources for the supply of tin, manganese and the other necessary metals, which, thanks to the freedom of the seas as maintained by the British Navy, were available for use against the enemy. And it seems as though this advantage must in the long run be a deciding factor in our favor as against the less favorable situation of the Central Powers." Referring to the enormously increased production of iron and allied products, Mr. Clarke continued: "The same general conditions obtained in respect of copper, lead, tin and zinc, production having increased very greatly since the outbreak of the war. While there was some shortage in copper during 1917, due mainly to labor troubles in the West, and zinc also showed a reduction in output, the military necessities of both our Government and the Allies have been fully met. The country's record in the war contributions of the metal industry is a handsome tribute to the patriotism, energy and ingenuity of the industry."

SUPPLY AND MACHINE DEALERS' CONVENTION

Men nationally known in the machinery, mill, mine, ship, contracting and plumbing supply field, both manufacturing and distributing, are represented among the chairmen of the various Cleveland committees which are working to make the War Convention of the supply industry the largest in the histories of the various organizations which will be represented.

To consider ways and means of keeping the supply and machinery industry at the top notch of efficiency as a means of carrying on the war to a successful and decisive conclusion will be the work of the convention. During the week of May 13 the Hollenden Hotel, Cleveland, will be headquarters for four large national conventions of men in related fields. Monday and Tuesday, May 13 and 14, the National Pipe and Supplies Association will meet. Wednesday, Thursday and Friday, May 15, 16 and 17, there will be a joint convention of the National Supply & Machinery Dealers' Association, the Southern Supply & Machinery Dealers' Association and the American Supply & Machinery Manufacturers' Association.

HOLLENDEN HOTEL, CLEVELAND, OHIO, WHERE THE SUPPLY AND MACHINERY DEALERS HOLD THEIR CONVENTION DURING THE WEEK OF MAY 13, 1918.

The entertainment program is simple this year on account of the war. It consists of a smoker on Wednesday evening and a musicale on Thursday evening. During the day entertainment will be provided for visiting ladies.

AMERICAN ELECTRO-PLATERS' SOCIETY

Announcement is made by C. S. Tompkins, 90 Griswold street, Detroit, Mich., secretary of the convention executive committee, that the convention of the American Electro Platers' Society will be held at the Hotel Statler, Detroit, Mich., July 1, 2 and 3, 1918. All meetings will be held at the Hotel Statler, with the exception of the meeting on Tuesday, July 2, which session will be held on the Steamer Sapho, which has been chartered exclusively for the society.

All persons interested in the art of electro-plating are invited to attend all meetings as interesting papers will be read and discussed. Platers are also invited to take part in the display of plated articles and it is expected that there will be a large exhibit of such articles. Also plating supply houses are invited to exhibit to the trade at this time what they have for the betterment of the industry.

Special features for the entertainment of the guests are under way and delegates are strongly urged to take their wives along as a special program has been prepared for the ladies who attend the convention.

Hotel rates and accommodations at the hotel may be made by addressing Harry Zeese, Manager, Hotel Statler, Detroit, Mich., and further information regarding the convention may be had from Mr. Tompkins at the above address.

Watch THE METAL INDUSTRY for the program of the convention.

Indianapolis Branch.—Meets second Saturday in each month at Hotel Denison. L. Mertz, 1725 Union street, Indianapolis, Ind., secretary.

The regular monthly meeting was held April 13, but the attendance was not very large. Two members were suspended for non-payment of dues and a paper was read by B. D. Aufderheid on brass plating.

Newark Branch.—Meets first, third and fifth Fridays of each month at 20 Central avenue, Newark, N. J. Frederick W. Matts, Jr., 169 Peshine avenue, Newark, N. J., secretary.

At the last meeting of this branch the members voted to purchase a Liberty Bond and for all members to pay the minimum amount of twenty-five cents a month to pay for the bond. The members of the Newark Branch are anxious to have it known that all members of the New York Branch are always welcome at their meetings.

New York Branch.—Meets second and fourth Fridays of each month at 32 Union Square. Thomas Haddow, president, and William Fischer, 300 St. Ann's Avenue, New York, secretary.

A social gathering was held by the New York Branch at the Broadway Central Hotel, New York, Saturday evening, April 27. The attendance was not as large as was expected, but the members who did attend spent a very pleasant evening. Another disappointment of the evening was the non-appearance of the vaudeville entertainers who had been engaged, and it was found necessary to call upon the platers present to furnish the talent. Recitations were given by several members from the Newark Branch, Mr. Lawrence of the New York Branch gave quite a few recitations and W. J. Schneider also told several interesting stories. Thomas Haddow went among the platers selling Liberty Bonds, after which refreshments were served.

Providence Branch.—Meets second and fourth Wednesdays of each month at No. 60 Weybosset street. Alberty J. Lemrise, 124 Waverly street, Providence, R. I., secretary.

The first meeting for the month of April was held on Wednesday, April 10, at which time several new members were initiated and applications for four aspirants were presented to the Board of Managers for investigation. Owing to the large attendance which has recently tasked the capacity of the present location, the branch discussed the matter of securing new quarters and a committee was appointed to investigate matters and report at an early date. The resignation of the librarian, Arthur W. Wood, was passed upon and accepted. Mr. Wood was thanked for the manner in which he has served the interests of this branch, having been in office since its formation in March, 1916. Mr. Wood recently enlisted in the Naval Reserves at Newport, R. I., and was presented with a military wrist watch by the members of the branch. The Providence Branch has started a series of discussions which commenced in January, the subjects of sodium cyanide, bright silver, nickel and copper having so far been taken up at the various meetings.

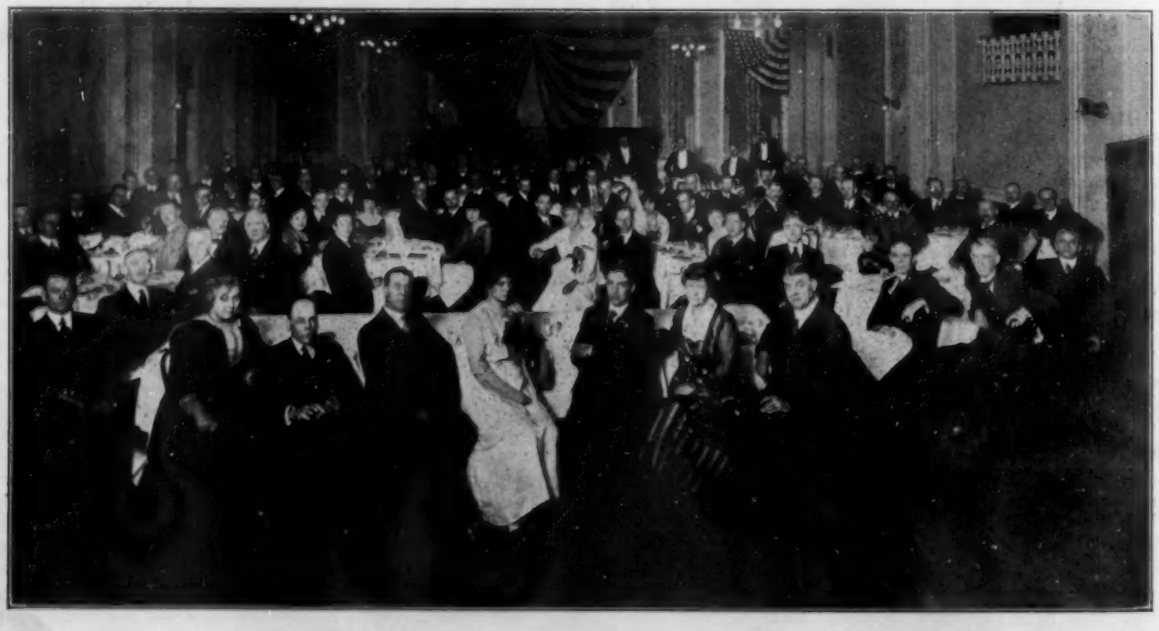
BRIDGEPORT BRANCH HOLDS FIFTH ANNUAL BANQUET

Bridgeport Branch—Meets third Friday of each month in its laboratory at 260 John street, Bridgeport, Conn. Royal F. Clark, Box 883, Bridgeport, Conn., secretary.

This branch held its fifth annual banquet at the Stratfield Hotel, Bridgeport, Conn., on the night of Saturday, May 4. During the late afternoon and early evening the members and guests gathered in the banquet hall where there were exhibited samples of new and old finishes on metals. Here the members and guests while viewing the exhibits exchanged views, telling the various experiences encountered during the performance of their daily work.

At 7:45 P. M. the dining room was thrown open and when all were settled at their respective places toastmaster N. A. Barnard announced that the banquet would be opened by singing the national anthem, "The Star Spangled Banner." Following this the banqueters proceeded to dispose of a substantial repast, at the conclusion of which toastmaster Barnard introduced W. R. Bassick, vice-president of Burns & Bassick of Bridgeport, Conn., who delivered an interesting discourse on "Co-operation." The speaker in his remarks referred to the co-operation of employer and employee and cited the importance of working hand in hand, especially at this time when it is so necessary to get the greatest production and work in a given time. Mr. Bassick concluded his address with a number of patriotic remarks.

Following Mr. Bassick, Miss Maraffi was introduced and entertained the gathering by executing on the piano Liszt's "Mazurka Brilliante." The last speaker was Floyd T. Taylor, electrical engineer, a graduate of the Massachusetts Institute of Technology and now connected with the Munning-Loeb Company, Matawan, N. J. Mr. Taylor spoke on the "Elements of Electricity as Applied to Electro-Plating" and he covered his subject very thoroughly. As Mr. Taylor's manuscript was immediately turned over to the society it was impossible to obtain a copy, but the subject will be published in an early issue of the



FIFTH ANNUAL BANQUET OF THE BRIDGEPORT BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY, HELD AT STRATFIELD HOTEL, BRIDGEPORT, CONN., MAY 4, 1918.

Platers' Monthly Review. Mr. Taylor's address was along the same line as the one delivered at the St. Louis, Mo., convention in 1917 under the title of "Electro-Plating Generators," which was published in THE METAL INDUSTRY for July, 1917.

The menu discussed at the banquet was as follows:

Mock Turtle Oloroso

Celery Olives

Kennebec Salmon Hollandaise

Duchesse Potatoes

Roast Turkey Stuffed

Cranberry Sauce

Au Gratin Potatoes Russian Turnips

Combination Salad

Neapolitan Ice Cream

Cake Coffee

The banquet committee responsible for the success of the undertaking was as follows: Nelson A. Barnard, William G. Stratton, George B. Hogaboom, J. M. Dunn, B. F. Kusterer, Thomas F. Slattery, E. A. Maraffi, William Thompson, David Fleming, T. F. O'Brien, Thomas Brosnan, Royal F. Clark.

LIST OF EXHIBITORS

Those who exhibited samples of metal finishes at the banquet were A. A. Brunell Company, Inc., Worcester, Mass.; A. Maraffi, Harvey Hubbell, Inc., Bridgeport, Conn.; J. M. Dunn, Factory C. International Silver Company, Bridgeport, Conn.; A. N. Theriault, Lockwood Manufacturing Company, South Norwalk, Conn.; Royal F. Clark, Acme Shear Company, Bridgeport, Conn.; N. A. Barnard, Burns and Bassick, Bridgeport, Conn.; Louis Maraffi, Hawthorne Manufacturing Company, Bridgeport, Conn.; Bridgeport Works of Remington Typewriter Company, Bridgeport, Conn., and American Chain Company, Bridgeport, Conn.

Members and guests attending the banquet were: W. G. Stratton, R. N. Bassett Co., Derby, Conn.; T. A. Trumbour, THE METAL INDUSTRY, New York City; J. M. Dunn, International Silver Co., Bridgeport, Conn.; V. H. Borg, Bridgeport, Conn.; E. M. Stephenson, Celluloid Zapon Co., Hartford, Conn.; T. F. Slattery, Cornwall & Patterson Mfg. Co., Bridgeport, Conn.; J. W. Slattery, Norwich Nickel Brass Co., Norwich, Conn.; A. J. MacDermid, The J. B. Ford Co., Wyandotte, Mich.; P. A. Willet, Burns & Bassick Co., Bridgeport, Conn.; J. C. Oberender, P. & F. Corbin Co., New Britain, Conn.; Thos. Brosnan, E. H. H. Smith Co., Bridgeport, Conn.; O. F. Carlson, Regina Co., Rahway, N. J.; C. Chambers, J. H. Sessions & Son, Bristol, Conn.; Wm. J. Schneider, Roessler & Hasslacher Chem. Co., New York City; B. F. Kusterer, Jennings Bros. Mfg. Co., Bridgeport, Conn.; N. E. Dabott, Celluloid Zapon Co., New York City; C. Frey, Maas & Waldstein Co., Newark, N. J.; Thos. Haddow, Aug. Goertz Co., New York, N. Y.; Chas. Phillips, Bridgeport Metal Goods Mfg. Co., Bridgeport, Conn.; Frank J. Clark, Munning Loeb Co., Matawan, N. J.; William Kusterer, Jennings Bros. Mfg. Co., Bridgeport, Conn.; Royal F. Clark, Acme Shear Co., Bridgeport, Conn.; Mrs. Royal F. Clark, So. Norwalk, Conn.; George J. Karl, Celluloid Zapon Co., New Haven, Conn.; N. A. Barnard and wife, Burns & Bassick Co., Bridgeport, Conn.; E. Maraffi and wife, Harvey Hubbel, Inc., Bridgeport, Conn.; J. A. Messick, American Brass Co., Waterbury, Conn.; T. Munson, Ball Socket Co., Cheshire, Conn.; D. W. Robinson, Remington Typewriter Works, Illion, N. Y.; Jas. H. Bissland, Hendee Mfg. Co., Springfield, Mass.; Chas. E. Dunn, S. L. & M. G. H. Rogers, Hartford, Conn.; S. Herrick and wife, Celluloid Zapon Co., New Haven, Conn.; Miss Mary Maraffi, Bridgeport, Conn.; R. H. Bowdon, Celluloid Zapon Co., New Haven, Conn.; J. W. Demars, Monroe Calculating Machine Co., Orange, N. J.; John W. Morton, Meriden, Conn.; Louis J. Maraffi, Hawthorne Mfg. Co., Bridgeport, Conn.; C. G. Backus, Munning-Loeb Co., New York City; John B. Fay, Munning-Loeb Co., New York City; R. B. Condit, The J. B. Ford Co., Wyandotte, Mich.; O. C. Miller, The J. B. Ford Co., Waterbury, Conn.; A. Perrin, Waterbury Mfg. Co., Waterbury, Conn.; H. M. Johnquest, Waterbury Mfg. Co., Waterbury, Conn.; Dayton Lasher, Waterbury Button Co., Waterbury, Conn.; Edward Burke, Autoyre Co., Oakville, Conn.; Justus A. Stremel, Brooklyn, N. Y.; John F. Hassnett, Warner Bros. Co., Bridgeport, Conn.; J. S. William, Warner Bros. Co., Bridgeport, Conn.; F. L. Langhammer, Warner Bros. Co., Bridgeport, Conn.; W. Thompson, Warner Bros. Co., Bridgeport, Conn.; George Begam, John R. Lyman Co., Springfield, Mass.; J. V. Giefrich, Bosch Magneto Co., Springfield, Mass.; Fred Joseph, Whiting Mfg. Co., Bridgeport, Conn.; A. W. Perry, Oakley Chemical, New York City; G. A. Wilkinson, E. H. Smith Co., Bridgeport, Conn.; Herbert Lowndes, Simpson Hall & Miller, Wallingford, Conn.; A. A. Hall, American Chain Co., Bridgeport, Conn.; Jas. F. Spain, Bridgeport Hardware Co., Bridgeport, Conn.; John Rall, Conn. Webb & Buckle Co., Bridgeport, Conn.; John Kautenwain, American Graphone, Bridgeport, Conn.; Edward Hedwell, Traut & Hine Co., New Britain, Conn.; F. B. Bosworth, Acme Shear Co., Bridgeport, Conn.; Randal O'Hara, Acme Shear Co., Bridgeport, Conn.; H. C. Flanigan, Celluloid Zapon Co., New York City; A. A. Brunell, A. A. Brunnell Co., Worcester, Mass.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

The spring meeting of the association was held at French Lick, Ind., March 27 and 28, 1918. The meeting was held under most favorable auspices, and while owing to sickness and in some cases members being detained at home on war orders it lacked in numbers, it made up in enthusiasm and material matters that it accomplished, as the following matters will indicate: It showed the association in a splendid financial condition, with a balance of $5,966.95. Reports were received on the matter of current costs and current market prices prevailing.

Among the many things considered and supplemental to the splendid report of the Cost Committee, which had been circulated in pamphlet form some time ago, it directed a cost accountant of one of the leading firms to prepare a detailed questionnaire covering the matter of foundry costs up to the finishing department, which will give a complete cost, the detail information to be supplied to the commissioner and reported out at the next meeting.

It further requested the National Committee to consider the advisability of establishing a central Credit Bureau or exchange in which will be handled all credits or delinquent accounts that the various members of the different trades and jobbers associations in the plumbing and heating industry may desire to submit to this Department, President Strauss being strongly of the opinion that if this work was taken over and energetically handled at a general headquarters by the National Committee instead of the several Credit Departments handled by the various organizations affiliated with the National Committee, that it would make the Bureau very much more effective.

The meeting passed the following order. The matter of State Trade Associations publications, magazines or bulletins be now referred to the National Committee, with an urgent request that they quickly pass legislation on same, putting all local, State and National organization papers, books, bulletins, magazines and other publications in the same class or category as they have the State Master Plumber exhibits, and it was further ordered and agreed and the members of the Association pledged themselves not to individually or in any way, patronize or take advertising space in such publications.

The meeting agreed to double its dues in the National Committee and urged all members to assist in every way possible to make the efforts and workings of this committee the success it should be in this growing line of business, and the idea in adding the additional amount was to afford the National Committee the opportunity to indulge in a wider sphere and greater activities; also added two additional delegates.

The sub-committee of the Standardization Committee, who have in hand the matter of adopting a uniform standard for all loose key work applying to the line and the adopting of a standard uniform hose thread, submitted a report and asked further time. Final action will be taken at the next meeting.

The committee's report on range boiler couplings and standard uniform basin cock shanks was submitted by the committee and adopted, the chairman reporting that on a referendum vote the association overwhelmingly adopted this report.

The Committee on Standardization was further authorized to proceed with standardizing the different styles of bibbs, etc., along the same basis that they have now established a standard weight of 13 ounces for the half inch No. 3000 Compression Plain Bibb and to bring in their report on same at the next meeting, which will be held in Cleveland, June 26 and 27, 1918.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

DEATHS

GEORGE J. JACKSON

George J. Jackson, president of the National Brass and Copper Tube Company, Hastings, N. Y., died at his home on Riverside Drive, New York City, April 8. Mr. Jackson was born in New York in 1861, and after receiving a college education was engaged in the dry goods and woolen business for some time.

GEORGE J. JACKSON.

In 1888 he became identified with the old National Conduit Company and remained with the same interests up to the time of his death. As stated above, Mr. Jackson was recently elected president of the brass and copper seamless tube interests of the National Conduit and Cable Company, which is now largely engaged in munition work, and it is characteristic of Mr. Jackson that he refused to accept any salary for the presidency, on the ground that all must do what they can to help the country.

Mr. Jackson leaves a wife and son, Gerard Jackson, who is in the Aviation Corps.

As was told in THE METAL INDUSTRY for April, 1912, the National Conduit and Cable Company, under Mr. Jackson's management, organized and developed the National Brass and Copper Tube Company, with the assistance of two well-known brass and copper men from the Naugatuck Valley—C. S. Morse and F. S. Loomis. The brass and copper tube end of the cable company's business was started about 1906, and since that time has grown to be one of the largest and most important installations in the tube business.

Following the establishment of the tube plant came a rod and wire mill, and to this was soon added a large brass foundry. This greatly increased the efficiency of the company as a brass producer, as it enabled them to furnish metal in sand castings, as well as tubes, rods and wire. In 1912 the last unit of the organization was added, being the brass-rolling mill, which at the time of installation was 600 feet long by 165 feet wide, and this has been added to considerably during the past six years.

The officers of the company at the time of Mr. Jackson's death were as follows: Morton A. Howard, vice-president, and H. J. Pritchard, secretary and treasurer. At the time of going to press, no successor to Mr. Jackson had been selected.

Charles B. Stanley, secretary and treasurer Stanley Rule & Level Company, manufacturers of brass goods, New Britain, Conn., died in New Haven, Conn., April 20, while returning from a visit in the South. He was a son of Augustus Stanley, one of the founders of the company, and has been associated with the business for forty years. He was 64 years old.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

May 6, 1918.

Business is not quite as heavy here as it has been and a few of the plants which had for months been working on war orders, which kept their maximum number of employees busy night and day, are now enjoying a slight slackening in the pace. This is due partly to a decline in war orders of foreign governments and partly to the comparatively low activity of domestic business. This latter has improved considerably during the past year, but has been left far behind the war business. At the same time there is evidence of a broadening of this field and there is no doubt that the progressive manufacturer has a solution of the situation in his own hands. This may require a resumption of the production of certain articles which were formerly produced in large quantities hereabouts, but which have been left to foreign producers, including Germans, for years. Of course, an important reason for this was the low profit. The argument was that the price of labor in this country made it impossible to compete with the foreign competitor.

It is interesting in this connection to repeat a story told about the Ingersoll Brothers, whose watch business has been so important to Waterbury industry. When the Ingersolls wanted a dollar watch manufactured they conferred with watchmakers who have a large factory in another city of Connecticut, and were told that no profit could be made on a dollar watch. Thanks to that decision the contract to produce the watch that made the dollar famous came to Waterbury. Until the war broke out in Europe the metal parts of the watch were produced here and the crystals were bought abroad. The war shut off the supply of crystals and the Waterbury Clock Company finally built a glass factory and began making its own crystals. It was the intention at first merely to make crystals for its own products, but the company has been prevailed upon to sell some of its output to other watch manufacturers of the country, who have been desperately searching for a crystal market for months.

One of the first activities of this year in the local factories was the organization of War Savings Stamp clubs. This has grown so that nearly all the larger factories not only have War Savings Stamp clubs buying thrift stamps and baby bonds, but $100 clubs. Even in some of the small plants the $100 clubs are rolling up the score so fast that there is some hope that the city will have 50 per cent of its quota for the year fully paid before July 1.

Numerous extensions of buildings are being made and the housing program of the Scovill Manufacturing ompany and the American Brass Company are going forward rapidly.—T. F. B.

BRIDGEPORT, CONN.

MAY 6, 1918.

The Third Liberty Loan is occupying considerable attention in the various factories of the city these days, and to the credit of the factories it must be said that they are distinctly "doing their bit" to help the third loan go over the top. Nearly all the smaller factories of the city have subscribed to the loan 100 per cent. strong and in the large factories, the showing, although smaller in percentage, is equally as heartening. The factory drive was held last week and this counted heavily in putting Bridgeport loan up to the required quota.

Work is still being rushed in all the metal factories of the city, although at the present time the absence of the drafted men

is beginning to make itself known in industrial ranks. The ordinary mechanics can be, and are, being replaced fairly well, but it is the drafting of the skilled and technical men that has hit some of the factories here rather heavily. All of the manufacturers, however, seem to be making the best of the situation and there is but little or no grumbling to be heard.

There is a chance that the Remington Arms Company, and possibly the U. M. C. also, may be tied up in a machinists' strike in the near future. The machinists are demanding a wage raise which the company seems disinclined to give with the result that a delegation of labor men have gone to Washington to seek government intervention. It is claimed by the men that without leaving the city they can secure positions which will pay them considerably more than they are getting at the present time.

A short time ago the government announced that the American Can Company had been nominated its agent to operate the Liberty Ordnance Company of this city. It is planned to increase the working force of the plant from its present number of about 1,000 to 2,000 within a short time. The reason for the change is that by doing so the government may have direct supervision over its work, holding the American Can Company as its agent.

The Remington Arms-Union Metallic Cartridge Company comes under the supervision of a new general manager from now on. D. B. Gauchet will hereafter assume supervision of the two plants.

Echoes of the coal shortage this past winter are being heard in the city these days because of the trouble some of the factories are encountering in placing their orders. There is about enough coal on hand in the dealer's yards and being received here every week to keep the city fairly well supplied, but those factories who are trying to secure a reserve for next year are having difficulty.

The local and state coal administrators, however, have had several conferences on the subject and both proclaim that the outlook is promising and that if plans under way at the present time mature, Bridgeport will not be revisited with another shortage similar to the past one.—L. M. P.

TORRINGTON, CONN.

MAY 6, 1918.

Wendell P. Norton, inventor of the Hendey-Norton lathe, has presented his resignation as works manager for the Hendey Machine Company. Mr. Norton was superintendent of the plant for 28 years and was made works manager two years ago. He entered the employ of the company in 1886 and has been employed there ever since with the exception of three years in the early '90's, during which time he was with the Garvin Machine Company of New York City. Prior to coming to Torrington he was with the Dwight Slate Machine Company of Hartford and the Seth Thomas Clock Company of Thomaston. It was at the latter plant that he served his apprenticeship to the engineering and machinist trade.

The Torrington Company, the $11,000,000 corporation which controls plants in various parts of New England and Canada, has purchased a tract of land near its Torrington branches and will erect thereon a three-story up-to-date brick building to be used as a home for its young women employees. The home will have accommodations for about 75. This is the first time that a Torrington concern has adopted a plan of this kind. Shortage of labor and the inability to induce young women to come here because of the lack of housing facilities are partly responsible for this new step. The construction work is to be started immediately.—J. H. T.

NEW BRITAIN, CONN.

MAY 6, 1918.

Continued government orders, plus a satisfactory amount of private orders at the concerns not affected so much by the war, keeps New Britain metal manufacturing establishments busy, with every indication that the coming summer months will see no let-up in the activities. At the present time, however, the war orders that are being filled at the various concerns far exceed the private orders and production is being speeded up to a maximum. As before, the New Britain Machine Company probably leads all in this war work and a new and large addition to the plant, begun several months ago, will be ready for occupancy within a comparatively few weeks. All sorts of war material is being made at the Machine Company, yet the anti-aircraft gun mounts continue to be the leader. During the past week several carloads of White Motor truck chassis arrived at the concern to be equipped with these mounts. The finished product is one of the elaborate and delicate gun mounts, attached to the automobile chassis, so that the gun can be hurriedly taken from place to place as the exingencies of war may demand. The gun mounts are really a delicate piece of machinery embodying various bits of apparatus for raising, lowering, turning, sighting and manipulating the gun in every way. The gun, which is finally mounted on the apparatus at a different factory, is of French bore, but has about a three-inch muzzle. Day and night shifts are employed at the Machine Company and day and night shifts are also employed by the Aberthan Construction company of Boston which is erecting the new factory building.

Another local item of more than passing interest to the manufacturing world is the announcement that the New Britain Machine Company has a large tract of land here, with a long railroad frontage, on which they plan to erect a new building at an early date. The tentative plans for this new factory building call for one 340 x 100 feet and the cost may be in excess of $125,000.

In connection with the new building of the Machine company, work is about to be started on installing a special spur track for the P. & F. Corbin division of the American Hardware Corporation. This spur track will greatly facilitate the work of transportation to and from this factory as heretofore all imports and exports had to be taken to the freight house by truck. The new track will branch off the main railroad line not far from the center of the city and will take such a course that it will pass the end of the New Britain Machine Company's new plant, thus affording additional opportunity for transportation for this concern as well. At the P. & F. Corbin Company a large business is being done in regular lines of locks, bolts, fasts, doorchecks, etc., and an additional large amount of work is being done on hand grenades and gas masks. In fact practically every factory in the city is co-operating to increase the output of gas masks and even the American Hosiery Company, which is a textile concern, is doing this work. Already several improvements on the original gas mask have been authorized as a result of the ingenuity of local workmen. Russell & Erwin, the Stanley Works, the North & Judd Manufacturing Company and several other factories are also making gas masks, which are being shipped out daily. Hand grenades also form a big part of local production and another concern engaged in this work is the Vulcan Iron Works, the local branch of the Eastern Malleable Iron Works. The rough castings from which the grenades are made, are moulded here.

The latest war orders that have been awarded to New Britain factories were made public on April 23 and two local concerns are immediately affected. The North & Judd Manufacturing Company has a big order to provide a large quantity of covert snaps for the war department. The Landers, Frary & Clark Manufacturing Company has been given two orders which they are especially qualified to fill. One is for a large supply of meat cans of the government model of 1910. The other is for a consignment of cavalry sabers of the 1910 model. These will be made in the cutlery department of the factory, trench knives and bayonets are turned out in large numbers.

While the New Britain concerns are necessarily profiting by the war, and their employes are likewise profiting by increased wages, patriotism takes precedence over all. The factory officials are more than generous in their subscriptions to Liberty Bonds and the various employes are contributing equally well. In patriotism plus mechanical ability New Britain is doing its part toward winning the war.—H. R. J.

PROVIDENCE, R. I.

MAY 6, 1918.

With practically every manufacturing establishment throughout the State that is engaged in handling metals in any form whatever, working either directly or indirectly on orders for the Federal Government, business conditions are rushing in all the plants. The concerns are constantly receiving plenty of new business and many of them have

enough orders ahead to insure their running to capacity for several months to come, even if no additional bookings were to be made.

The fuel and transportation situations—two of the vexatious problems that have been confronting and handicapping the manufacturers for several months past—have shown a decidedly steady improvement in the last few weeks, so much so, it is claimed that manufacturers have ceased to worry concerning them, at least for the time being. The fuel question is one that may have to be met in the fall again, but until then the manufacturers are making the most of the improved conditions. There still remains, however, the increasingly vexatious problem in connection with the labor situation. Skilled labor is still at a premium and the scarcity is daily becoming more pronounced and will continue to become so, many of the large employers of men think, with the coming of warm weather, and the likelihood that a number of the men, especially the younger ones, will be taken in the various drafts.

Next to the direct problems of business the manufacturers, as well as the employes, and in fact everybody in every walk of life, have been actively engaged in the third Liberty Loan bond campaign, each doing his utmost to carry Rhode Island "over the top" with the same generous over-subscription that has always characterized every patriotic, charitable or philanthropic movement in which the State has entered. In the great drive the metal trades—employers and employes—showed up to meritorious advantage and while no definite figures are available, it is known that no industry exceeded, either in total amount of bonds taken or in per centage of employes subscribing, the metal industries.

Co-ordinate with the Liberty Loan bond is the interest that is being manifested in the hundreds of boys who have already gone, or are leaving, for the various cantonments, training camps, over seas and into the various departments of government work. Already the sorrowing news is coming back from across the water of young men of this city and vicinity, who have been killed or wounded in the great world struggle for humanity and democracy. Among these have been several who, before their enlistment, were identified with one or the other of the metal trades.

The Continental Metal Company, 362 Carpenter street, has awarded the contract for a one-story frame storage building, 20 by 25 feet, and for an addition to the machine shop, 10 by 36 feet, of frame construction, one-story high.

The great success that attended the cultivation of gardens by employes of the large manufacturing establishments throughout this city and vicinity last year, and the necessity of the cultivation of even a larger number this year, has caused several of the large concerns to secure large grants of land for planting purposes. According to Secretary Joseph J. McCaffrey of the Providence Board of Recreation, which has taken a census of all available land for planting purposes, 170 more permits have so far been granted than were in force last year, which calls for 1,007,010 square feet more of land. The Brown & Sharpe Manufacturing Company has received 110,134 square feet; the Chapin-Hollister Company and the Martin-Copeland Company, both manufacturing jewelers, have received about 54,000 square feet of land each.

Morris A. Teath has filed his statement at the office of the city clerk that he is the sole owner of the Providence Co-operative Sheet Metal Company, 209 Cranston street.

William A. Viall, superintendent of the Brown & Sharpe Manufacturing Company, delivered an interesting and instructive address on "The Employment of Women in an Industry" before the members of the National Metal Trades Association at a convention session in the Hotel Astor, New York, on April 24.

Rhode Island Metal & Machinery Company, 477 Eddy street, is being conducted, according to statements filed with the city clerk's office, by Israel Broomfield and Harry Broomfield of this city and John Broomfield of Chelsea, Mass.

W. H. M.

ROCHESTER, N. Y.

MAY 6, 1918.

The month of April just closing has not been a particularly eventful one in manufacturing circles, owing to the fact that prevailing conditions have been unchanged. Some of the big munition plants are receiving their final equipment, and within a short while the industrial arteries of Rochester will be vibrating at full speed.

The situation in this city has undergone little change, too, from the fact that help has not been obtainable as required. In two of the war munition plants hundreds of women have been employed, so great is the demand for all kinds of labor and the shortage has proved to be so acute. Inability to find proper housing facilities, owing to exorbitant demands by landlords, has operated to keep mechanics and laborers away from the city or diverted them to other localities where property-owners are not so selfish.

Shipping facilities have improved in and out of the city during the past month. Deliveries are much better, except for galvanized products. The control of the government in that direction has interfered with deliveries here.

In the opinion of most large manufacturers the prospects for the coming month are exceedingly promising. There is a tremendous amount of business on hand, more coming in from day to day, and with the amelioration of the labor shortage the high tide of prosperity ought to be reached.

The market for spelter in Rochester is weak. It is quoted here at 6.65c. Aluminum is still a scarce commodity, with little obtainable and slow delivery at that. Yellow brass sheets and rods are in fairly reasonable supply and deliveries are good. Copper conditions are fully as good. Much brass and copper is being used in Rochester just now, owing to the increased output of the munition plants. Tin is obtainable in small quantities at regular governmental price. Little stock is being openly offered for sale, but it can be had. In many instances, however, users have been required to show that the tin was to be used in the manufacture of essentials. There is some spot tin on the market, but it requires a guarantee to get it.

The immense new plant of Bausch & Lomb Optical Company in St. Paul street is enclosed and is receiving its equipment. In due time it will be running full blast, turning a high grade of war materials. An immense assortment of metals will be required for this new plant, brass, copper and steel predominating.—G. B. E.

MONTREAL, CANADA

MAY 6, 1918.

Spring activity among metal manufacturers and founders supplying castings to the trades continues to develop here.

The metal market is very active and prices are slightly higher than the previous month. The opening of navigation here in the spring is the means of stimulating a large amount of business.

The combining of the International Nickel Company of Canada and the Canada Copper Company in a fifty million dollar concern has been the chief interest here the past week as large stocks of shares are held here and it not only makes Canada the dominant factor or producer of nickel ore but the centre of world's nickel refining industry as well. No official confirmation of the report has been obtainable, but Britain Osler, provisional director of the International Nickel Company of Canada, admitted that the increase of the company's stock from $5,000,000 to $50,000,000 which was approved at Ottawa this month was suggestive.

The International Nickel Company of Canada came into existence on July 25, 1916, when letters patent were made out incorporating the company were issued by the Dominion Government. The company was organized to comply with a demand made by the Dominion government backed up by a demand and representations from the Ontario government that nickel ore be refined in Canada in sufficient quantity to at least supply the British Empire. The company remained a subsidiary of the International Nickel Company of New Jersey just as the Canada Copper Company which mines the ore was a subsidiary. Work was started shortly after on a large refining plant at Port Colborne, Ont., and is now near completion. Mr. Britton says refining operations will commence by the first of May. With the probability of the prices of silver remaining above the 90 cents per ounce for the duration or long possibly after the war and the possibility of the price rising to one dollar per ounce in the near future, the outlook for the cobalt mines is bright. The reasons are two. First, such a price allows for a large margin of profit on each ounce of silver pro-

duced. Second, the fact that the mine workers are paid a one dollar bonus for every shift worked when the price of silver is above 90 cents an ounce appears to be reasonable that no labor disturbance will take place.

The Mason Regulator Company, of Dorchester, Mass., are moving into three new Canadian factories located here in St. Henri, the great manufacturing district of Montreal. The plant is located on the north side of Dagenais street, St. Henri, and is being fitted up with the latest tools and machines for manufacturing a full line of brass, bronze and iron body brass mounted pressure regulators for use on steam, water, gas and air.

The Dominion Lamp Company has been incorporated with a capital stock of $100,000 by Philip H. Klein, president, Westmount, Montreal, and Henry B. Irving and Edison G. Pease, to manufacture brass goods and lamps.—P. W. B.

DETROIT, MICH.

MAY 6, 1918.

The two great shipbuilding companies here which maintain large brass, copper and aluminum plants, have completed a number of oceangoing ships, which will leave the lakes as soon as navigation through the Welland Canal and the St. Lawrence River is opened.

The Ford Motor Company is bending its energies now to the production of aeroplane engines and equipment, and also is spending millions of dollars for new plants and expansion work.

The automobile industry has been cut heavily, with the exception of truck production. The Packard Motor Car Company is engaged in producing heavily for the war. The same is reported regarding the Studebaker Corporation, the Cadillac Motor Company, and in fact all the other big automobile companies in the city and suburbs.

The Harroun Motor Corporation also has a great amount of government work on hand, such as shell contracts.

Detroit is reported at present one of the greatest producers of government supplies of any other place in the country. The highest wages are paid and labor conditions are reported excellent in the plants.

The Detroit Valve & Fittings, and Detroit Brass Works, the first year of operating the two units in Detroit aand Wyandotte as one corporation, reports sales amounting to $3,065,733, an increase of $417,554 over 1916, at which time they operated as separate companies. Gross earnings were $348,424.

It is announced that fifty Detroit concerns have contracts involving not less than $500,000,000 for the manufacture and assembling of Liberty Motor Trucks. Cleveland is reported second to Detroit, with about half that amount. Among concerns reported to have large contracts are the Packard Motor Company, Continental Motors Corporation, Hinkley Motor Corporation, Timken-Detroit Axle Company, Detroit Gear & Machine Company, Gemmer Manufacturing Company, McCord Manufacturing Company, National Cam Company, Long Manufacturing Company, Michigan Malleable Iron Company, Michigan Stamping Company, International Metal Spinning Company, Detroit Battery Company, and the Edmunds & Jones Corporation.—F. J. H.

CINCINNATI, OHIO

MAY 6, 1918.

The campaign for the Third Liberty Loan in Cincinnati has had the fullest co-operation of business men in all industries, and this is true of the numerous large machinery and metal concerns in the city. All of these have made substantial contributions on their own account, as well as aiding their employees to buy in small quantities by the weekly payment plan; and this general participation in the loan was largely instrumental in enabling the city to go "over the top" before the campaign was half over, subscribing about $24,000,000 before the end of the second week of the four weeks' campaign, while the amount set in the allotment to this district was only a trifle over $20,000,000. By the time the campaign is over it is now hoped that a total oversubscription of 100 per cent. will be obtained, making the amount of bonds bought $40,000,000. As this sum was largely exceeded in the second loan, there is no reason to believe that it cannot be attained in this one.

Business continues at a high level among the machinery manufacturers, and a number of extensions and additions are being planned by them, in order to enable the plants to take care of the business offered. In spite of the shortage of labor, which has been a severe handicap ever since the activity caused by the war began, the machine tool plants are turning out a tremendous amount of work, and thereby doing their share to keep the war going favorably to the United States and the Allies.

The Fewlase-Leen Brass & Iron Company, located on Front street, has purchased a property on Pike street, and will remodel it for occupancy at once.

The D. T. Williams Valve Company, which recently acquired the nearby plant of the Queen City Brass & Iron Works, has purchased additional vacant property adjoining its plant, and is preparing to build an addition, the company's business having increased so rapidly during the past year that even with its increased facilities it has been unable to take care of the demand.

The plant of the National Brass Company, 1115 Marshall avenue, Cincinnati, was threatened with destruction by fire recently, when a load of excelsior caught fire, and a damaged fire plug prevented prompt action. The blaze was extinguished without much loss, however.

James H. Birch, Jr., manager of the Cincinnati branch of the United Lead Company, died on March 22 at his home in Walnut Hills from pneumonia, contracted while attending a meeting of Rotary Clubs at Zanesville, O.

The Lima Brass Foundry, of Lima, O., will build a new plant at a cost of about $15,000, and work has already started on the new structure.

The strike of foundrymen in Hamilton, O., has been settled by all except one company, an agreement having been signed, effective April 1, under which the minimum pay, from that date, is $5.00, with an increase to $5.25 on May 15, and piece-workers to be paid on a six-dollar-a-day basis.

The Drennen Brass & Bronze Company, of Warren, O., has been incorporated with a capital stock of $10,000, by John Drennen and others.

The West Virginia Lead & Zinc Company, recently organized at Parkersburg, W. Va., with a capitalization of $300,000, will operate mines in Ottawa County, Oklahoma.—K. C. C.

COLUMBUS, OHIO

MAY 6, 1918.

The metal market in Columbus and central Ohio territory has been rather firm during the past month. Demand for all metals has been normal and buying is limited largely by the ability to make deliveries. Transportation is still quite complicated and it is doubtful if there will be any improvement on that score for some time.

The strongest feature in the trade is the demand for type metals and prices are firm all along the line. Buying is for immediate delivery. Brass is also firm and prices are unchanged from the previous month. Copper of all kinds is moving fairly well at previous levels. Aluminum is rather slow and the prices are unchanged from previous quotations. Tin and zinc are both in fairly good demand.

Dealers in metals are plodding along under government control and can see little change in the future. Munition factories are buying in large quantities and in those cases shipments are preferred by priority orders. Other lines of manufacturing are considerably restricted.

The new foundry of the Columbus Metal Company, at 459 South Parsons avenue, has been put into full operation. This company was incorporated on March 27 for $30,000. The building occupied by the new company is 104 feet by 34 feet and contains ample warehouse facilities in addition to the foundry room, where four furnaces are to be operated. The company will make castings of all kinds and sizes and carry constantly a large stock of castings and bushings.

The Salem Brass and Bronze Company, of Youngstown, has increased its capital from $25,000 to $150,000.

The Metal Parts Manufacturing Company, of Cleveland, has been incorporated with a capital of $10,000 to manufacture metal articles. The incorporators are: Sterling Newell, Ellis R. Diehm, R. C. Green, J. C. Pettit and Paul J. Bickel.—J. W. L.

CLEVELAND, OHIO

MAY 6, 1918.

Plans for giving more aid to the government in prosecuting the war to successful conclusion for America, were taken up at the annual meeting of the National Association of Ornamental Iron and Bronze Manufacturers held at Hotel Hollenden the week of April 22. According to J. E. Raber, leading member of the organization, there is nothing ornamental among the members now except the name of the association. This, he explained, is because the members are using their factories to make army kitchens and small ammunition. The result is that the normal business of those connected with this part of the metal industry has been cut about 50 per cent. The contention was made at the meeting that restriction of building operations is the prime factor in hurting business, and to this end a resolution was sent to Washington, asking that building operations not be restricted beyond what is absolutely necessary to successfully promote America's part in the war. In the resolution it was stated that a mere mention from government authorities that the government will not interfere with business activities beyond the absolute necessities of war will serve to bring out money from many hidden places and stimulate business, and consequently production, immensely.

The King Bronze and Aluminum Foundry Company has acquired a parcel of land adjoining its property on East 37th street, near Payne avenue, in anticipation of additional building needs.

Reflection of the German spy activities in this city was seen this week when an employee of the Rubay Company, on the West Side, which has been making airplanes for the government, was arrested. He is charged with drilling holes in vital parts of the machines, so that they would capsize when they were in the air.

New industry priority ruling by the government is the subject most under discussion with the turn of the month among Cleveland manufacturers. More light on the subject is sought by those in all lines of industry, and to this end a meeting is planned by the Industrial Association of Cleveland. President Charles Woodward, of the association, will try to have a representative of the war industries board visit Cleveland at an early date and explain the new regulation more thoroughly. Of chief interest here is the phase of the ruling affecting raw materials and transportation, both of which are to be given preference to the industries most important to the war. It is the belief of manufacturers here that those industries not supplying the war needs direct, will not be placed in this class, but the uncertainty of the ruling and the consequent effect upon production here should be cleared up, producers say.

Of particular interest to the Cleveland metal industry, is the plan to augment transportation east and west from New York State points to Chicago, and possibly beyond, by pressing into service a fleet of government-operated steamships on the Great Lakes. While the principal communication will be between Buffalo and Chicago, it is the aim of business and industrial interests in Cleveland to get this city as one of the stopping places for the boats. Action to that end is planned after more definite information is received here from the office of Railroad Director McAdoo. At first, seven vessels will be used, and this number will be increased as the demand warrants. According to H. R. Rogers, traffic manager of the Cleveland and Buffalo Transit Company, the move will greatly relieve east and west railroad freight conditions. The rail rates will prevail on the ships.

Although the end of the war is apparently quite far off, this has not deterred Cleveland manufacturers from preparing for export trade after the conflict is over. The move is being made through the foreign trade department of the Cleveland Chamber of Commerce. It is based upon the advantages the new merchant marine will afford. Through information now being sent out, 325 manufacturers in the Cleveland district are being made acquainted with the methods used by leading exporters to establish competent trade representatives. This department also is preparing to advise manufacturers about division of territory which may properly be assigned to foreign representatives. Statistics and other data on export trade also are being prepared.

In a survey of industrial conditions in Cleveland as they affect women since the war began, Miss Rachel Gallagher, of the women's department, State-City Employment Bureau, announces that 80,000 women are employed in manufacturing here now, most of them in different branches of the metal industry. This is an increase of 26,000 since 1910, says Miss Gallagher. Miss Charlotte Rumbold, of the Industrial Welfare Committee of the Cleveland Chamber of Commerce, adds that these women are paid the same as men for piece work, and on straight wages they earn more than boys and less than men, but that this latter condition is offset by fewer working hours or lighter work.

Regarding the export conditions after the war, it is the opinion of Charles L. Hoover, former consul to Prague and Carlsbad, Austria, that American manufacturers need fear no extreme competition from either Austria or Germany for at least three years after the war. He claims that manufacturers in those countries will be occupied principally in stocking up during that period. Mr. Hoover was in Cleveland at the invitation of the Chamber of Commerce to talk to manufacturers on just these conditions. Machinery, textiles and foodstuffs are needed most in these countries, said Mr. Hoover, and the time is required to bring these up to normal. He urged Cleveland manufacturers to cultivate the South American trade, which he says has been neglected during the war.

One of the most important steps toward increasing the production in Cleveland of metal products and all materials needed by the war department was taken last week when 30,000 square feet of storage space was leased in the New Ninth Street Terminal Warehouse Company's building on West Ninth street by the Cleveland War Industries Commission for the United States Quartermasters Department. Because manufacturers will not be hampered so much in getting their materials and products to the Quartermasters Department, they can increase production, and place it in this newly leased space. Heretofore it has been necessary to hold much stock in their own storage space, thus cramping further production. Up to this time shipments have been made from Cleveland to the Quartermasters Department at Chicago, and lack of adequate transportation facilities has been a drawback to speeding up.

Manufacturers particularly interested in the war needs of the country, are giving attention to the claims of L. R. Carpenter, Cleveland inventor, who says he has produced an aluminum engine for aviation purposes, of 24-cylinder capacity and developing 800 horsepower. The motor weighs 900 pounds, and can be extended to 48 cylinders by lengthening the crank shaft. The motor is all air cooled. Mr. Carpenter says it will do all the famous Liberty motor will do and more. He says the Liberty motor weighs 800 pounds and develops 420 horsepower. Mr. Carpenter has been studying aviation for years, and has built two planes. His new motor he has been working on for the last three years.

Plants of the Grabler Manufacturing Company in the southeastern section of the city, were destroyed by fire, following an explosion in the core room. The company has been manufacturing hand grenades for the government. The fire is said to have started from a leaky oil pipe, and police are investigating the suggestion the pipe had been tampered with. According to William S. Bayer, the loss will amount to $200,000. The Grabler company has been one of the largest plumbing supply manufacturers in the country, but much of this business was dropped the early part of this year in order to meet the demand for war munitions.

Another serious fire, believed to have been started by spies, is being investigated by federal authorities, following the partial destruction of the plant of the Arth Brass and Aluminum Castings Company, Superior avenue and East 33rd street. According to A. H. Arth, the firm is making castings for the government. The principal loss is in cores and patterns, said Mr. Arth. The damage done was about $10,000.

SAN FRANCISCO, CAL.

MAY 6, 1918.

We are glad to report that the Brass Industry on the Pacific coast is now in the most flourishing condition it has ever been in since its inception.

Probably sixty per cent. of the brass being made is for ship work. While some of the shipyards are operating their own foundries and are getting out a large tonnage of brass and bronze castings, jobbing foundries are sharing in this work to a notable extent. Good results are being obtained from this industry in many ways. The rush of work to the shops in many cases has

exceeded their capacity, with a natural consequence of many foundries enlarging their plants and putting in additional equipment to the extent of giving us brass working plants right at home that compare favorably with the best institutions of this kind in the East.

It has always been considered that Coast brass foundries were operating under obsolete methods with crude equipment, and large contracts were being placed with Eastern concerns due to the fact that our own manufacturers did not have sufficient equipment to handle business in any great quantities. This thought has been dispelled and today we can probably say that there is no brass casting work getting away from us, and that we are in position to handle any sized contracts in as expeditious a manner as any of the large plants of the United States, conforming as we do to Government specifications both from a metallurgical as well as from a physical standpoint.

On the subject of manganese bronze castings, which up to a short while ago were made here by the importation of Eastern manganese ingots, these castings are today being manufactured in vast quantities and the metal is being produced at home by the foundries themselves.

Aluminum castings for aeronautical work are keeping many of our foundries busy and the castings, such as crankcases, housings and smaller parts are being turned out efficiently in every particular.

We believe this to be a new era in the brass industry on the Pacific Coast, and circumstances are so shaping themselves that the brass industry, which has been lying dormant for so many years, has at last awakened and will continue to grow so that it will become one of the great factors in the manufacturing line. —C. F. A.

LOUISVILLE, KY.

MAY 6, 1918.

Conditions have shown much improvement in Louisville during the past month, and whereas many plants were working from hand to mouth, today they are generally busy and there is a greater demand for coppersmiths than can be supplied. Most of this activity is in connection with milk machinery, and machinery for drying and evaporating milk, consisting largely of kettle and condenser work. In addition a number of plants are handling a lot of Government work, principally for the Submarine Corporation and the Emergency Fleet.

The R. Rogers Company, of Detroit, Mich., manufacturers of milk evaporating machinery, recently placed a number of contracts for copper work with local coppersmiths, some of this work going to Ahlers & Gregoire, the Vendome Copper Works and others. Although this work is not as profitable as distillery work, the latter is off of the market, and anything is good to fill in with.

A change was recently made in the Vendome Copper & Brass Works, whereby C. J. Thoben, secretary-treasurer, withdrew to go with the Biechner Preserving Company, of Louisville. E. E. Sherman is head of this organization.

The Independent Brass Works has been swamped with Government work during the past few weeks. J. W. Rademaker, head of the company, said: "The trouble we have experienced is in gauging our work. The Government adds to or doubles many contracts, which often causes us to have more work on hand than we have an actual capacity for, and indications are that we will be good and busy up into 1919."

Hines & Ritchey, coppersmiths, have been giving practically their entire attention to milk machinery. Tom Hines reported that he was handling jobs from Michigan to Texas, and in both the East and West, in addition to two excellent local contracts on creameries. Mr. Hines stated that the milk machinery demand had been a Godsend, and came at a time when the distillery business was shot to pieces.

Prices for copper, ingot, sheet and tube, have settled down nicely as a result of Government regulation of price, and this is also holding prices on used material down considerably. Old copper is quoted at 22½@23 cents per lb., brass at 12@18 cents, according to weight and quality, and lead at 8 cents.

Fire breaking out in the brass moulding department of the Illinois Central Shops, at Paducah, Ky., recently destroyed patterns, equipment, etc., amounting to a large figure. The damage to the shop itself was only about $1,000. Many locomotive parts are made in these shops.

A number of large manufacturing and jobbing plumbing establishments, metal workers, supply houses, etc., are expected to have representatives present at the annual convention of the Kentucky Master Plumbers' Association, which will be held in Danville, Ky., on May 20 and 21.

The C. Lee Cook Company, manufacturers of bronze and other metallic packings, has let contracts for erection of an addition to the Louisville plant. This addition will cost about $10,000. Practically no new machinery will be required, as it is the intention to gain more room, and assemble the machinery to better advantage.

In order to facilitate operations the Belknap Hardware and Manufacturing Company, of Louisville, Ky., large jobbers of brass goods, manufactured articles, etc., has filed amended articles of incorporation increasing the capital stock from $4,000,000 to $5,000,000. William Heyburn is president.

The Foundry Equipment & Metals Company, capital $10,000, was recently incorporated to handle metals, machinery and tools. Frank X. Bertsch is the active manager.—O. V. N. S.

PHILADELPHIA, PA.

MAY 6, 1918.

Lead was in good demand for immediate needs during the month in some quarters, but as a whole the call was light because most of the consumers are reported as well covered on stock. The local trade report that production has been sufficient to meet all requirements.

A quiet tone is noted in the spelter market for prime Western. The demand runs toward high grade stock which is being taken for government contracts.

With supplies on antimony exceeding the demand prices eased off toward the close of the month and quotations were made at 12¼ to 12½ cents.

Local brass concerns report that the market for brass products continues steady with little disposition on their part to quote prices except where certain stock is specified. While the shipping situation is far from satisfactory the trade reports that embargoes are being placed for a certain period by one railroad, then lifted, which is followed by the placing of an embargo by another railroad. In this way they are able to keep stock moving to a fair degree.

The Syracuse Smelting Works, Brooklyn, N. Y., has filed statement of claim in the Common Pleas Court in an action brought against Hanson Brothers, 704 Sansom street, to recover $824.66, a balance alleged to be due for wire solder, etc., sold and delivered.

It is reported among the local trade that the Standard Metallic Products Company, Paulsboro, N. J., manufacturers of metallic specialties for war purposes, has closed its works temporarily because unable to secure raw materials.

A scarcity of labor is still noticeable among the metal trades. The Metal Manufacturers' Association of Philadelphia, who maintain an employment bureau, have been successful during the month in placing a fair amount of help among the trades. The most difficulty lies in securing competent help.

Resolutions calling upon Director General of Railroads McAdoo for a revision of the shipping regulations were passed at a meeting of the Philadelphia Foundrymen's Association at the Manufacturers' Club April 3. The embargo on foundry facing in carload lots was discussed. Howard Evans, secretary of the association, pointed out that should less than a carload of firebricks be shipped, each individual brick, under the regulations must be tagged and the work necessitated in making the shipment represented a greater value that the shipment itself. H. A. Plusch, of the Abrasive Company, of Frankford, gave a lecture on the manufacture of grinding wheels, which was illustrated by lantern slides. Thomas Devlin, president, acted as chairman.

Considerable difficulty in securing sheet tin due to embargoes being placed at various times is causing considerable trouble to the trade. There appears to be a fair demand in most quarters.

Large contracts for grinding wheels of all descriptions are held by the Abrasive Co. This firm finds that labor is scarce and that high class men are at a premium.

Copper is in little demand except for war work and the trade

does not look for any change in the situation for at least several months. Prices held at the established basis of 23½ cents for carload lots and 24.67½ for smaller quantities.

A scarcity of pig tin is noticeable and it does not appear to be a question of price but of getting the stock, and the trade say that judging from the number of inquiries from consumers that they are becoming anxious over the situation. The sharp advance in tin which occurred just prior to the close of the month caused a furore in the trade. This was due to advices from London that gave an advance which meant about 2½ cents a pound here, and the holders of tin immediately advanced prices. Chinese stock is about the only stock that is held.

A new machine shop is to be erected by Hugo Bilgram at 1217-33 Spring Garden street. It will be three stories, 75 by 160 feet, and cost approximately $100,000.—F. W. C.

TRENTON, N. J.

MAY 6, 1918.

The metal industries of Trenton have plenty of work on hand, but find it difficult to secure the required amount of material because of the big demands for the same by the United States government. The government is greatly in need of copper and brass and the plants not actually engaged on government work are compelled to wait for their material and take what is left. William G. Wherry, president of the Skillman Hardware Manufacturing Company, has returned from a two weeks' business trip through the Middle West. He informed a representative for THE METAL INDUSTRY that he found business very good in the different states he visited, but all concerns had the same complaint about the shortage of both material and men. "While we would like to have more product on hand," he said, "we are willing to make sacrifices and aid the government to win the mighty conflict." The Skillman Company, like the other Trenton plants, finds another drawback in securing skilled help. Many skilled hands in the Trenton plants were called in the first draft and recently more were compelled to leave their trades and become soldiers.

The City Commission has awarded a contract for the erection of a two-story brick workshop addition to the School of Industrial Arts on North Willow street, where classes in watchmaking, sheet metal drawing, metal casting, metals and their compounds, art metalworking and jewelry, etching brass plates and explosives will be conducted. The class for training watchmakers has already met with big success and has greatly benefited the Ingersoll-Trenton Watch Company. To those who master the art are given positions by the Trenton Watch Company. The young men are taught under the direction of expert instructors from the watch company. The Ingersoll Company some time ago made this offer to the city of Trenton for young men to learn a trade of that class of metal working and secure a good position rather than import watch makers from other cities. The city followed out the suggestion and found many young men who wanted to learn not only watchmaking but also photo-engraving, etc. The new workshop will cost $45,000 and the plans were drawn by Architect J. Osborne Hunt, of Trenton.

A. Mitchell Palmer, alien property custodian, has reorganized the Bronze Powder Works Company, Elizabeth, N. J. This company is engaged in the manufacture and sale of bronze powders and has a capital stock of $250,000, which is 99 per cent. enemy owned. The enemy stock of the company has been assigned to the alien property custodian, who has designated Henry T. Heald, of the alien property custodian's office, to act as director.

The Standard Metallic Products Corporation has closed its plant at Paulsboro for an indefinite period owing to the inability to obtain material for the manufacture of munitions, for which it holds large contracts. Many hands are thereby thrown out of employment. The corporation made every effort to get in a new supply of material, but finally had to give up. The Bordentown plant of the corporation is still running, but the supply of material is getting low and it will probably have to close down later.

The Pyrophoric Metals Company, of Newark, N. J., has been incorporated under the laws of New Jersey to manufacture and deal in metals and alloys. The capital stock is $100,000 and the incorporators are: George W. Cunningham, of Paterson; William Rea, of Bloomfield, and William Bonnman, of Passaic.

A. J. Krohn & Sons, Inc., of Bloomfield, N. J., has been incorporated with $10,000 capital stock to manufacture and deal in metal beds, etc. The incorporators are: A. J. Krohn, of Bloomfield, N. J., and Herman Krohn, of Newark.

The American Reclaiming and Refining Company, of Bayonne, has been incorporated with $250,000 capital stock to reclaim and refine metals. The incorporators are: Bernard Rubin, Charles Dembe and H. B. Dembe, all of Bayonne.

The New Jersey Smelting Company, which conducted a plant at Holland avenue and Old Rose street, has failed and the works are now closed up. The plant will not be reopened again for smelting purposes.

A charter of incorporation has been granted to the New Jersey Metal Products Company, of East Orange. The company is capitalized at $100,000 and will engage in the manufacture of metal novelties. The incorporators are: Henry H. Picking, Charles O. Geyer and Lewis Matthews.

The Aluminum Ware & Manufacturing Company, of Newark, N. J., has been incorporated in New Jersey with a capital stock of $1,000,000 to manufacture aluminum ware. The incorporators are: John E. Potter, George F. Bradenburgh and James H. Opp.

The Premier Manufacturing Company, Newark, has been incorporated with $100,000 capital to manufacture metal and wood novelties. The incorporators are: John F. Faughnan, Bertrand L. Premo, Newark; J. Sidney Wolff, New York.—C. A. L.

VERIFIED NEWS OF THE METAL INDUSTRY FROM SCATTERED SOURCES

The Driver-Harris Company, Harrison, N. J., manufacturers of wire, etc., is constructing a two-story addition, 75 x 120 feet, to its plant.

The Lima Brass Foundry Company, 459 North Main St., Lima, Ohio, is erecting a one-story fire proof brass foundry at an estimated cost of $15,000.

The Eureka Brass Company, 615 Red Bud street, St. Louis, Mo., is erecting an addition to its foundry at a cost of $12,000. The company operates a smelting and refining department and a brass, bronze and aluminum foundry.

The Menten Brass Company, recently incorporated with a capital stock of $25,000, has established a foundry and brass machine shop with offices at 76 Lexington avenue, Brooklyn, N. Y., for the manufacture of high-grade alloy castings.

The Globe Machine & Stamping Company, Cleveland, Ohio, will build a four-story factory addition, 60 x 212 feet. The company operates a tool and grinding room, stamping, brazing, soldering, plating, polishing, japanning and lacquering departments.

The Bristol Brass Company, Bristol, Conn., will plow up a tract containing thirty-eight acres of land, all of which, except about ten acres, will be marked off in one-eighth acre tracts, which will be allotted to such of their employees as desire to plant vegetable gardens.

William Allan Ragan, formerly special sales agent of the U. S. Reduction Company, E. Chicago, Ind., has been appointed sales representative of the United Smelting & Aluminum Company, Inc., New Haven, Conn., for the states of Indiana and western Ohio.

Landers, Frary & Clark, New Britain, Conn., is erecting an addition, 45 x 225 feet, two stories, to its plant. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, casting shop, cutting up shop, spinning, stamping, tinning, soldering, plating, polishing, japanning and lacquering departments.

The **American Zinc Products Company,** Greencastle, Pa., on April 13, turned out its first rolled zinc products. The company expects to have three more mills erected and operating about the first of May and two additional mills about May 15. H. S. Buck, vice-president and general manager, reports that the capacity of each mill is about twenty tons daily.

The **Welland Iron & Brass Company,** Welland, Ont., Canada, recently organized by E. J. Anderson, has taken over the old Beatty plant and will establish a brass and iron foundry and a machine shop. They will manufacture brass, bronze, copper, acid resisting metal, aluminum, etc., and have most of their equipment already purchased but state that they may require additional brass furnaces—pit furnaces, using coke for fuel.

The Smith Foundry Company, Greenfield, Mass., formerly of Turners Falls, has purchased the carriage building at the corner of Davis and Norwood streets, and has opened a foundry for the production of brass, bronze and aluminum castings. The plant is equipped with all modern machinery and appliances and will use three different fuels, gas, coal and coke, so that failure of supply of any one of them will not necessitate a shut-down.

The Brass Fixtures Company factory at Southington, Conn., has been sold to the Miller Metal Works Company, Jersey City, N. J., manufacturers of brass tubing and other specialties. The Miller Company will transfer its plant from Jersey City to Southington sometime during the month of June and will increase its production considerably. The company operates a brass machine shop, tool and grinding room, tinning, brazing, soldering, plating and polishing departments.

An unusual series of sales for assisting salesmen has been worked up by the **Moller & Schumann Company,** maker of varnishes, enamels and japans, Marcy and Flushing avenues, Brooklyn, N. Y. They take the form of a page which may be inserted in a loose leaf folder and hold samples of the enamel on metal inserted in the page. For example, one shows the gloss olive drab, such as is used on airplane radiators. Selling points are outlined, such as giving a chance to the purchaser to attempt to scratch the enamel or to bend and twist the enameled metal, etc.

The Nickel Alloys Company, Hyde, Pa., is planning for the erection of a one-story addition, 140 x 240 feet, to be used as a tube mill, at a cost of about $250,000. The company is operating a rolling mill, with all three high stands, consisting of one 22-inch mill, one 18-inch mill and one 14-inch and 9-inch mill, and are just completing a casting shop for nickel and its alloys. The company is in the market for the following equipment: machinery for tube making, straightening, wire drawing, cold rolling, strip rolling, polishing, skelping machines, swedging machines, annealing pots, complete outfit for rolling foil and draw benches.

INCREASE IN CAPITAL STOCK

The Naugatuck Valley Crucible Company, Shelton, Conn., manufacturers of crucibles for melting brass, copper and other metals, has increased its capital stock from $250,000 to $450,000.

FIRES

Fire recently destroyed the plant of the **Watson-Frye Company,** 19 Broad street, Bath, Maine, manufacturer of bronze castings. The loss is estimated at $75,000 and the company reports that they will not rebuild.

The statement that fire recently destroyed the plant of the **Waterbury Manufacturing Company,** Waterbury, Conn., manufacturers of brass goods, is not correct as the fire was confined to the top floor of one of the concrete buildings with no serious loss and no stoppage of work.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

26844.—A firm in Canada desires to purchase tin sheets AAA quality, size 30 by 59, or 30 by 30. Quotations should be made f. o. b. point of shipment. Cash will be paid.

26848.—A company in India desires to purchase hardware sundries, brass fittings, etc. It also wishes to entertain an agency proposition for the sale of same. Reference. post (P[1]).

REMOVALS

The offices of the **National Galvanizing Company,** Inc., are now located at 1613 North Front street, Philadelphia, Pa.

The Silvel Metal Manufacturing Company, manufacturers of Silvel metal, the white metal alloy, has removed its New York office from 165 Broadway, to 21 East 40th street. The company has an extensive foundry in operation at Farmingdale, L. I.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

The Tallman Brass & Metal, Ltd., Hamilton, Ont., Canada, has been incorporated with a capital stock of $800,000 by Joseph N. and William N. Tallman and others, to take over the plant and business of the same name.

The Buckeye Brass Castings Company, Lima, Ohio, has been re-incorporated as the Buckeye Casting Company with a capital of $10,000. Louis P. Stephens is president and general manager of the company, which operates a brass, bronze and aluminum foundry.

To operate a brass foundry and machine shop.—The Kelly Brothers Manufacturing Company, Belington, W. Va. Capital $50,000. Incorporators: J. A. Viquesney, president; J. P. Kelly, vice-president; M. J. Kelly, secretary and treasurer, and J. F. Kelly, general manager.

To manufacture metals.—The Foundry-Equipment and Metals Company, Covington, Ky., Capital $10,000. Incorporators: A. E. Clifton and others. The company has acquired the former plant of the Kenton Foundry Company, which will be used for the present for storage purposes, but later a foundry may be operated.

PRICES FIXED ON NICKEL

An agreement has been entered into between representatives of the **International Nickel Company,** New York, and Bernard Baruch, representing the Council of National Defense, fixing the price of nickel at 40c. per pound for the highest grade and 38c. per pound for the lower grade. Nickel is being used in increasing quantities daily in making munitions. Practically all nickel produced by the International Nickel Company is pledged to the Allies in advance, and only what the Allies do not want is sold to the public. No nickel can be sold by the company except with the consent of the British Government. The price previous to this was 50c. to 55c. per pound.

HELP WIN THE WAR

The National Traffic League has issued a circular in the national colors giving some suggestions as to how manufacturers can help win the war. This circular says that by conserving transportation facilities by means of observing six suggestions that shippers may perform a great service to the nation. These suggestions are as follows: 1. Loading and Unloading Cars Promptly. 2. Loading Cars to Their Full Safe Carrying Capacity. 3. Double Loading. 4. Ordering Only Enough Cars to Take Care of Your Immediate Needs. 5. Furnishing Specific Instructions as to Delivery Desired. 6 Ordering in Maximum Quantities—Car Capacity Whenever Possible.

AMERICAN RED CROSS

The American Red Cross at Washington, D. C., has recently sent out a letter suggesting a method by means of which American manufacturers, architects and all draftsmen may perform important service to their country. To this end the Red Cross is asking for all the cotton and linen cloth that is possible to get, and the circular states that two kinds of cloth are available —draftsman's tracing cloth and old linen and cotton articles to be donated from private households and, often in large quantities, from hotels. These can be easily collected and handled by the modern laundries, which have now been called upon to perform this work for the Red Cross. With their facilities for collecting, washing, sterilizing and delivering to the local chapters, the laundries are in a position to perform an invaluable service, and the least that other trades can do, is to help them in every way. If any manufacturer, architect, or draftsman will go to the slight trouble of calling up either the local Laundryowners' Association or one of the large laundries of his city, he will find them only too glad to send for such cloth as he can give them.

GOVERNMENT NEEDS MEN

Important chemical and other technical engineering work necessary for the prosecution of this war is being carried on by the Bureau of Mines Experiment Station, at Washington, D. C. The services of trained men of the following classifications are urgently needed:

Bacteriologists	Instrument Makers
Biologists	Laboratory Assistants
Chemists, Inorganic	Laborers
Chemists, Organic	Machinists
Chemists, Physical	Physiologists
Chemists, Electro-	Plumbers
Chemical Engineers	Steamfitters
Draftsmen	Stenographers
Electrical Engineers	Skilled labor of various kinds.

If your training fits you for any of these occupations send to the Bureau of Mines, American University Experiment Station, Washington, D. C., for blank forms. When properly executed and returned by you, these forms will be placed on file, and when a vacancy occurs you will be considered for it and will be notified if your services are desired.

If you are a registrant in the draft and have not yet been ordered to camp, it may be possible to have you immediately inducted into the service for work here.

If you are *not* in the draft, but feel that you wish to serve your country in the present crisis, you can enlist or serve as a civilian.

Serve your country where you can serve it best.

SIGNAL CORPS NEEDS MEN

Ten thousand machinists, mechanics, chauffeurs, and other skilled workers are needed at once by the Aviation Section, Signal Corps.

The present call for 10,000 men is to fill an immediate need and may be regarded as the precursor of others as the service is being built up. Even at that the actual strength of the service today is over one hundred times what it was on April first last year.

The dependence of the Air Service on the most highly skilled men is being brought out more emphatically with every week of development. Where in the first rush there was little experience to indicate this fact, it has since developed that practically 98 men out of every 100 in the service must be skilled in some branch of work.

Airplane work has been wholly new and unfamiliar to American mechanics, who have been taken from other trades and converted hastily into workers on the most delicate kind of jobs. It has been necessary for both officers and men to learn very largely by experience. At the same time a degree of care and attention not usually associated with American quantity production and methods has been required, as great watchfulness is essential to prevent any plane leaving the ground in imperfect condition.

Men registered in the draft may be inducted into this service by applying to their Local Draft Board. Men not registered may enlisted at any recruiting office. Further information may be had by applying to the Air Division, Personal Department, Washington, D. C. In either case they will be sent to San Antonio, Tex., for segregation by trades, followed by a brief course of instruction at the flying fields or at various factories and organized into squadrons mostly for service overseas.

PRINTED MATTER

Oxy-Hydrogen Generator.—The Electrolytic Oxy-Hydrogen Laboratories, New York, has issued Bulletin G, which is concerned with the description and explanation of the Levin oxygen and hydrogen generator, for which it is claimed produces gases of a higher purity than any other generator.

"This, That, Those and These."—is the title of a very refreshing and entertaining little booklet published by Frederic B. Stevens, Detroit, Mich. The booklet is made up of matter taken from various after dinner speeches and other utterances of Mr. Stevens and the wit and humor is interlarded with serious minded advice and information relating to the extensive line of foundry supplies dealt in by Mr. Stevens in his spare time.

Crushers.—The Mine and Smelter Supply Company, New York, has issued Bulletin No. 42, containing thirty-eight pages descriptive of the Marcy ball mills. These mills are used for the crushing of materials containing metallic or mineral products and are now being quite extensively introduced into foundries and casting shops of metal melting companies for recovering the metallic values of foundry waste. Copies of the bulletin will be sent upon request.

Heat Treatment by Cyanide.—The Roessler & Hasslacher Chemical Company, New York, N. Y., give a description in a little booklet just published of the heat treatment, such as case hardening and so forth, of steel or iron products by means of cyanide, which product they use under the name of cyanide chloride mixture and cyanide chloride carbonate mixture. Full instructions for using this compound are contained in the booklet which may be had upon request.

Grinding Machinery.—The Modern Tool Company, Erie, Pa., has issued four bulletins in loose leaf form descriptive and illustrative of their Magic chucks, self opening die heads, and collapsible taps. These various tools are used on drill presses, lathes, and screw machines and are claimed by the manufacturers to have many advantages over like equipment now on the market. Copies of these bulletins which are numbered 31, 32, 33, 34, may be had upon application.

Electro-galvanizing.—The Galvanizing Corporation of America, Brooklyn, N. Y., has issued a forty-five page booklet, together with an index, on the subject of electro-galvanizing. In this little book the advantages of electro-galvanizing in general and the merits of the solutions and equipment used by this company, under the name of Standard in particular, are exhaustively treated. There is included also a good deal of information that is particularly valuable to those interested in the cold zincing of metals.

Babbitt Metal.—The United Smelting and Aluminum Company, New Haven, Conn., announce through the issuing of a small folder that they are now manufacturing USA brand of babbitt metal. This metal is made in five grades, which are intended to cover every possible service. The names of these brands are USA motor babbitt, USA long life, USA special babbitt, USA rolling mill babbitt and USA "Havabar" babbitt. The above company would be pleased to receive inquiries for these babbitts and also for some of their other products, such as bar, wiping and wire solder, in addition to the various grades of aluminum and aluminum alloys manufactured by them.

Hydraulic Valves and Fittings.—A new catalog of Hydraulic Valves and Fittings has just been issued by The Hydraulic Press Manufacturing Company, of Mount Gilead, Ohio. The book is quite elaborate in make-up and presents the complete H-P-M line very attractively. The four general classes of hydraulic valves are clearly illustrated and described. These are operating, check, knock-out and safety. Every standard type of hydraulic fitting is also listed, also accumulator controls, pressure gauges, hydraulic pipes, etc. Many of these hydraulic devices are of improved design and are here published for the first time. Interested parties may obtain copies from the above address.

Copper Castings.—The Titanium Bronze Company, Niagara Falls, N. Y., has issued a very interesting little brochure devoted to high conductivity castings. This company states in the bulletin that they are producing castings of pure copper, running as high as 99.8 per cent and that in consequence of this the improvement in electrical conductivity is very great and allows for the reduction of cross sections in a great many cases. The bulletin contains some interesting micro-graphs of pure electrolytic copper ingots and also copper containing impurities and that which has been treated by means of Titanium. Various forms of literature on Titanium aluminum bronze, phosphor bronze castings and die cast aluminum bronze will be furnished upon request.

"Hiring and Firing."—"Labor Turnover" is estimated on the basis of reliable facts to cost the country a billion and a half dollars every year. Every new employee costs a house $25.00 to $1,000.00 or even more. What steps are being taken to reduce this expense by first selecting employees intelligently and, secondly, keeping and developing them?

All managers interested in this and other employment problems from the modern point of view will find a good guide in a pamphlet of sixty pages, entitled "The Employment Department and Employee Relations," which is the joint work of F. C. Henderschott, of the New York Edison Company, and F. E. Weakly, employment manager of Montgomery Ward & Co., and which is issued by the La Salle Extension University, Chicago, Ill.

Machining.—In these days when the most important business of the metal working shop is "speed up production," the two little booklets just issued by the Fulflo Pump Company, of Cincinnati, Ohio, should prove of great interest. The first of these booklets is dedicated to the Fulflo pump manufactured by this company, and which is so constructed without any check valves that it will be always prime and will pump the instant the machine is started. Another great advantage claimed for this pump is the fact that it does not clog and therefore it is always in perfect working order. The second bulletin is "Scientific Lubrification of Cutting Tools" and goes very well with the Fulflo pump, which, of course, is used to pump the cooling lubricants employed on the cutting tools of a machine shop. The second booklet contains sixteen pages and is full of valuable information for metal workers. Copies of both of these bulletins may be had upon request.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

AMERICAN BRASS DIVIDENDS

American Brass Company, Waterbury, Conn., has declared an extra dividend of 3½% a share in addition to the regular quarterly dividend of 1½%, payable May 15 to stock of record April 30. Three months ago the company declared an extra dividend of 3½% in addition to the regular quarterly dividend of 1½%.

NATIONAL LEAD COMPANY DIVIDENDS

The National Lead Company earned a net profit of $4,896,-952 in the year ended December 31, an increase of $1,919,253 over the preceding year. In terms of the common stock the balance for dividends was equal to slightly more than $15 a share after providing for the preferred stock disbursement.

The report said it was believed by the management that the 5 per cent dividend could be maintained. Stockholders numbered 7,152 at the end of the year, a gain of 512 during 1917. Half the shareowners are women.

METAL STOCKS MARKET QUOTATIONS

	New York, May 6, 1918.		
	Par	Bid	Asked
Aluminum Company of America	$100	500	600
American Brass	100	227	235
American Hardware Corp	100	127	131
Bristol Brass	25	40	42
Canadian Car & Foundry, com	100	30	33
Canadian Car & Foundry, pfd	100	75	78
Eagle Lock	25	70	75
International Silver, com	100	40	50
International Silver, pfd	100	78	81
New Jersey Zinc	100	234	237
Rome Brass & Copper	100	290	325
Scovill Manufacturing	100	455	470
Standard Screw, com	100	235	240
Standard Screw, "A" pfd	100	107	111
Yale & Towne Mfg. Co.	100	210	220

Corrected by J. K. Rice, Jr., & Co., 36 Wall St., New York.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

Written for The Metal Industry by W. T. Partridge.

May 6, 1918.

COPPER.

Notwithstanding various rumors that production of copper was likely to suffer from this, that and the other reason, statistics prove that there are ample supplies of metal not only for all war needs but for all commercial requirements as well. March domestic output is estimated at 192,000,000 pounds, but imports, for which figures are not yet available, are believed to have decreased heavily. Total production for first quarter, 1918, is estimated at 633,000,000 pounds of blister copper, while refined output was about 530,000,000 pounds. With the Allies' requirements running about 70,000,000 pounds a month, and United States requirements estimated at 60,000,000 pounds, there was left 45,00,000 pounds per month available for domestic commercial consumption in the first quarter.

Exports in March, not including shipments to Canada, were 22,556 tons according to Government figures. Since January 1

total exports are estimated 93,447 tons as compared with 134,805 tons for the same period in 1917, indicating a decrease of about 32 per cent.

The drive for a higher Government price gained in momentum as the month progressed, with interest of not only the copper trade but of the entire metal industry centered in the result of the meeting to be held May 22d.

TIN.

Spot Straits tin was unobtainable at any price in New York during April. The demand for future positions was active and heavy but sellers were few and much of the business negotiated was not closed. Prices for other grades than Straits, at the close, had advanced to 91@92c. for L. & F. May shipment from England, subject to permit, and to 95.00c. for April-May shipment from China for Chinese No. 1 metal. It is understood that energetic measures for the conservation of pig tin in this country are to be inaugurated by the Tin Committee as a result of the extraordinary situation existing.

Arrivals at Atlantic ports during April were only 550 tons with 5,000 tons estimated afloat from the Far East. Arrivals of Bolivian tin in March were 368 tons. Since January 1 2,582 tons have been received, as compared with 1,388 tons in the corresponding period 1917—an increase of 1,194 tons.

LEAD.

The lead market in April was inactive with declining prices. The American Smelting & Refining Company reduced its official basis from 7.25c. New York to 7.00c. on the 11th, this being the same price that prevailed in the outside market for spot, with ⅛c. higher asked for future positions. A week later ore declined from $85 to $80 per ton. The market closed with the Trust price 6.92½c. East St. Louis, 7.00c. New York. Spot and April in the outside market were nominal at 7.00@7.12½c. New York, 6.50@6.55c. St. Louis.

SPELTER.

Excessive production during 1917 resulting from exaggerated anticipations of the amount of spelter that would be required by the Government in carrying out its war program has resulted more or less disastrously to the industry as a whole. Progressive weakness continued throughout April with declining prices. Statistics of the Engineering & Mining Journal show stocks on hand at the close of March 64,000 tons, which indicates an increase of 4,000 tons since December 31, 1917. Zinc ore declined from $40@60 for the various grades to $37@55, while prices of metal during the month declined from 7.00@7.17½c., St. Louis and New York respectively, for prompt Western shipment, to 6.70@6.90c. at the close, with the usual differential between the East and West; the net decline for the month being ⅝c. per pound.

ALUMINUM.

The aluminum market in April, outside of Government buying, which is understood to be in large volume, was at a standstill. Owing to the lack of detailed information given by the Government covering the regulation of sales, the small aluminum retail trade was in a state of perplexity. Industrial consumers of the Allied countries are not included in the restrictions as to price, it is believed, and the Export Company was reported to be selling to such consumer at 38.00c. per pound. No virgin aluminum was offered at the Government price in the open market.

The gauge base for aluminum sheets, first fixed for 20 gauge and heavier, was changed to 18 gauge or heavier. Prices are fixed at 32.00c. for virgin ingots and for 98@99 per cent. remelted, in 50 tons, f. o. b. plant; for carload lots, 32.10c. and for 1 to 14 tons, 32.20c.

For No. 12 remelted, 50 tons or more, 32.20c.; for carload lots, 32.30c., and for 1 to 14 tons, 32.40c. The base price for sheets, 18 gauge or heavier, is 40.00c. for 50 tons or more, for carload lots, 40.20c., and for 1 to 14 tons, 40.40c. per pound.

ANTIMONY.

United States Government statistics for the first two months of this year show total importations of antimony amounting to 1,998,877 pounds as compared with 3,363,574 pounds for the same period in 1917. Stocks in bond February 28, 1918, were 9,750,815 pounds, a decrease of 650,867 pounds since January 1, 1918. The demand for antimony during April was light. Prices at the beginning were 12.50@12.75c. per pound. As time passed with only small buying spasmodically, these figures were shaded to 12.25@12.50c., but in the last few days, with evidences of renewed activity there was a recovery to 12.50@12.75c., making the net recession for the month only ⅛c. per pound.

SILVER.

Government statistics for 1917 silver production give 74,244,500 fine ounces valued at $61,140,300, showing a reduction in output of 170,303 fine ounces below that of the 1916 output of 74,414,802 fine ounces.

The silver bullion bill as reported to the senate provides for the melting of $350,000,000, held in the Federal treasury to be used in meeting foreign trade balances; the Director of the Mint being authorized to replace the silver dollars by purchases made at $1.00 per ounce. It is believed that the effect of this bill will be not only to stabilize the market but to stimulate production. The United States now produces nearly 50 per cent. of the world's output of silver.

Prices during the month advanced from 92⅛c., April 1, to 99⅝c. at the close. Imports of silver in March amounted to $7,000,000 while exports were $13,000,000.

QUICKSILVER.

Early in April, the Government commandeered 1,300 flasks of quicksilver, paying $115 per flask, each holding 75 pounds. Later, producers were ordered to reserve 40 per cent. of output for Government requirements for which $105 per flask of 75 pounds will be paid for deliveries at San Francisco Mare Island Navy Yard, from the output of mines in California, Oregon and Nevada. Texas producers will be paid the same price for deliveries at Marathon, Texas. For deliveries made to New York and to Brooklyn, the price paid by the Government will be 75c. additional.

Production in the United States in 1917 was increased 12 per cent. over that of 1916. Imports in 1917 amounted to 5,000 flasks. No restriction was made by the Government in the prices to be paid for the 60 per cent. of production that will be available to consumers, outside of Government requirements. Market quotations during the month were unchanged at $120@125 per flask.

PLATINUM.

The Government price to be paid for platinum has not yet been officially announced. Meanwhile, in the general market during the month, price quotations have remained unchanged at $105 for pure and $113 for 10 per cent. iridium.

OLD METALS.

The old metals market during April was fairly active, there being some scarcity in the different staples at times, particularly in composition, crucibled copper and aluminum scraps. Solder and tin scraps were scarce throughout the month under very active demand. Zinc scraps were quite neglected. Price advances were 4c. on pure tinfoil to 49@50c.; on block tin pipe, 5c., to 75@77c.; on old pewter 3c., to 53@55c.; on upainted aluminum ½c. to 24c. Recessions were 1c. on uncrucibled copper to 20.00@21.00c.; ½c. on heavy brass to 13.50@13.75c.; 1c. on old cast aluminum to 20.00@21.50c.; on heavy lead and on stereotype ¼c. per pound to 5.75@6.00c. for the former and to 7.75@8.00c. for the latter.

WATERBURY AVERAGE

Lake Cooper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50. April, 23.50.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40. April, 8.50.

APRIL MOVEMENTS IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	*23.50	*23.50	*23.50
Electrolytic	*23.50	*23.50	*23.50
Castings	*23.50	*23.50	*23.50
TIN	market nominal; no metal offering		
LEAD	7.37½	7.00	7.086
SPELTER (Brass Special)	7.25	6.87½	7.134
ANTIMONY	12.75	12.25	12.523
ALUMINUM	†32.10	†32.10	†32.10
QUICKSILVER (per flask)	$125.00	$120.00	$124.204
SILVER (cts. per oz.)	99.75	91.37½	95.346

* Government price... †Government price for carload lots effective since March 5.

Metal Prices, May 6, 1918

NEW METALS.	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, nom. / Lake, carload lots, nominal... } Government price.	23½
Casting, carload lots, nominal	23½
TIN—Duty Free.	
Straits of Malacca, carload lots	none offered
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	7.125
SPELTER—Duty 15%.	
Brass Special	7.00
Prime Western, carload lots, nominal	6.925
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	
100-lb. f. o. b. factory	
Ton lots, f. o. b. factory.....Government price.	32.20
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot.	12¾
NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.	
Shot or Ingots	40 to 43c.
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$2.25
BISMUTH—Duty free	3.65
CADMIUM—Duty free	nominal 1.70
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	3.00
QUICKSILVER—Duty 10% per flask of 75 pounds	125.00
PLATINUM—Duty free, per ounce	105.00
SILVER—Government assay—Duty free, per ounce	.99½
GOLD—Duty free, per ounce	20.67

INGOT METALS.			Price per lb.
Silicon Copper, 10%	according to quantity		50 to55
Silicon Copper, 20%	"	"	50 to55
Phosphor Copper, guaranteed 15%	"	"	57 to62
Phosphor Copper, guaranteed 10%	"	"	55 to60
Manganese Copper, 30%, 2% Iron.	"	"	65 to72
Phosphor Tin, guaranteed 5%	"	"	1.25 to1.30
Phosphor Tin, no guarantee	"	"	1.10 to1.15
Brass Ingot, Yellow	"	"	17 to19
Brass Ingot, Red	"	"	25 to26
Bronze Ingot	"	"	24½to25½
Parsons Manganese Bronze Ingots	"	"	30½to32
Manganese Bronze Castings	"	"	44 to50
Manganese Bronze Ingots	"	"	26 to30
Phosphor Bronze	"	"	24 to30
Casting Aluminum Alloys	"	"	38 to39

Dealers' Buying Prices.	OLD METALS.	Dealers' Selling Prices
22.00	Heavy Cut Copper	23.50
22.00	Copper Wire	23.50
19.00	Light Copper	21.00
21.00	Heavy Mach. Comp.	23.50
14.00	Heavy Brass	16.00
10.50	Light Brass	12.50
13.00	No. 1 Yellow Brass Turning	13.50
18.00	No. 1 Comp. Turnings	21.00
6.00	Heavy Lead	6.50
5.25	Zinc Scrap	5.70
10.00 to 13.00	Scrap Aluminum Turnings	11.00 to 14.00
19.00 to 21.50	Scrap Aluminum, cast alloyed	21.00 to 23.00
26.00 to 28.00	Scrap Aluminum, sheet (new)	28.00 to 30.00
55.00	No. 1 Pewter	60.00
22.00 to 23.00	Old Nickel anodes	25.00 to 26.00
30.00 to 32.00	Old Nickel	34.00 to 36.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 31½c. base net
From stock ..... 33c. base net

The following table shows the advance in cents per pound over the base price of sheet copper of various gauges, lengths and widths.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. to 32 oz.	16 oz. to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	CENTS PER LB.				CENTS PER LB. OVER BASE.				
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not Wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							
	Longer than 120 ins.	5	8							
Wider than 120 ins., but not wider than 132 ins.	Not longer than 132 ins.	6	9							
	Longer than 132 ins.	7								
Wider than 132 ins.		8								

[The insert shows the extras on copper sheets from 10, 9, 8 and less than 8 oz. in weight, and various lengths and widths.]

Width.	LENGTH.	Light than 8 oz.	8 oz.	9 oz.	10 oz.
Not wider than 30 ins.	Not longer than 72 inches.	9	6	4½	3
	Longer than 72 inches. Not longer than 96 inches.		9	7½	6
Wider than 30 ins., but not wider than 36 ins.	Not longer than 72 inches.				
	Longer than 72 inches. Not longer than 96 inches.				
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.				

The longest dimension in any sheet shall be considered as its length.

Metal Prices, May 6, 1918

Extras for Copper Sheets.

Circles, 8 in. diameter and larger, segments and pattern sheets, advance per pound over prices of sheet copper required to cut them from..... 3c.

Circles less than 8 in. in diameter, advance per pound over prices of sheet copper required to cut them from..... 2c.

Cold or hard rolled copper, 14 oz. per square foot and heavier, advance per pound over foregoing prices..... 1c.

Cold or hard rolled copper, lighter than 14 oz. per square foot, advance per pound over foregoing prices..... 2c.

Cold rolled annealed copper, the same price as cold rolled copper.

All polished copper, 20 in. wide and under, advance per square foot over the price of cold rolled copper..... 1c.

All polished copper, over 20 in. wide, advance per square foot over the price of cold rolled copper..... 2c.

For polishing both sides, double the above price.

The polishing extra for circles and segments to be charged on the full size of the sheet from which they are cut.

Cold rolled copper, prepared suitable for polishing, same prices and extras as polished copper.

All planished copper, advance per square foot over the prices for polished copper..... 1c.

Tinning.

Tinning sheets on one side, all sizes, per square foot, 5c.

For tinning both sides double the above price.

Extra for tinning or polishing circles and segments, to be charged on the full size of the sheet from which they are cut.

For tinning edges of sheets, one or both sides, prices shall be the same as for tinning all of one side of the specified sheet.

Oval Copper Bottoms.

Tinned One Side.

16 oz. to square foot and heavier, per pound.....Base
15 oz. to square foot per lb., advance over base..... ½c.
14 " " " " " " " " " .....1c.
13 " " " " " " " " " .....1½c.
12 " " " " " " " " " .....2c.
11 " " " " " " " " " .....3c.
10 " " " " " " " " " .....4c.
Lighter than 10 oz. to square foot, per pound.....7c.

Round copper bottoms, tinned one side, 8 in. (203.2) diameter to 17 in. (431.8) diameter, both inclusive, 1c. per lb. advance over ovals.

Copper circles, tinned one side, less than 8 in. (203.2) diameter, 3c. per lb. additional.

Copper circles, tinned one side, over 17 in. (431.8) diameter, not classed as copper bottoms.

Polished oval and round tinned copper bottoms, same advance as for sheets.

Copper Anodes or Battery Plates Not Larger Than 20 x 30.

⅜ in. (9.5) and thicker, untrimmed..... lb.
¼ in. (9.5) and thicker, trimmed to size..... lb.
If drilled, full weight before drilling to be charged.

Nickel-Plated Copper.

Net Cash Prices.

Sheets 14 x 48 (355.6 x 1219.2) Inches.

	Advance over base per lb.	Plating per sheet
14 and 16 oz. and heavier, by the case of 500 pounds and over.....	6c.	40c.
14 and 16 oz. and heavier, less than one case....	7c.	42c.
12 oz. and lighter, by the case.....	8c.	40c.
12 oz. and lighter, less than one case.....	9c.	42c.

Boiler Sizes.

Over 12 (.40) Oz.

By the case of 500 lbs., 7 in. (177.8) (14 x 52) (355.6 x 1320.8).....	6c.	45c.
By the case of 500 lbs., 8 in. (203.2) (14 x 56) (355.6 x 1422.4).....	6c.	45c.
By the case of 500 lbs., 9 in. (227.6) (14 x 60) (355.6 x 1523.6).....	6c.	50c.

For less quantity than one case, add 2c. per lb. 12 oz. and lighter, add 3c. per lb.

Tinning.

For copper nickel plated on one side and tinned on the other, add for
All sizes, per square foot.....3½c.

Note.—The figures in heavy face type in all cases represent metric measurements.

BARE COPPER WIRE—CARLOAD LOTS

26½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order..... 37c. per lb. base
100 lbs. to 300 lbs. in one order..... 38c. " " "
Less than 100 lbs in one order..... 39½c. " " "

SEAMLESS COPPER TUBING

38 to 41 base.

BRASS MATERIAL—MILL SHIPMENTS

In effect January 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.28	$0.31	$0.33
Wire	.28	.32	.34
Rod	.26	.32	.34
Brazed tubing	.36	—	.41
Open seam tubing	.36	—	.41
Angles and channels	.36	—	.41

To customers who buy less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.29½	$0.32½	$0.34½
Wire	.29½	.33½	.35½
Rod	.27½	.33½	.35½
Brazed tubing	.37½	—	.42½
Open seam tubing	.39½	—	.42½
Angles and channels	.37½	—	.42½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

SEAMLESS BRASS TUBING

35½ to 38½ base.

SEAMLESS BRASS TUBING—IRON PIPE SIZES

35½ to 38½ base.

IRON LINED TUBING—NOT POLISHED

Due to fluctuations of the metal market we are unable to quote these prices.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod..... 33½c. net base
Muntz or Yellow Metal Sheathing (14" x 48") ..30c. " "
Muntz or Yellow Metal Rectangular sheets other than Sheathing .....33c. " "
Muntz or Yellow Metal Rod..... 31c. " "
Above are for 100 lbs. or more in one order.

Metal Prices, May 6, 1918

SHEET ZINC

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%

Casks, jobbers' prices.....Price on application

Open casks, jobbers' prices.....Price on application

The above prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments.

ALUMINUM, SHEET, ROD AND WIRE

Sheet Aluminum, outside market contract base price, 40c. per pound.

98-99% Remelt Aluminum Ingots, outside market, 32c. per pound.

No. 1 Virgin Aluminum Ingots, outside market, 32c. per pound.

Aluminum Rods and Wire, outside market, prompt shipment. No quotation.

EXTRAS FOR ROLLING FLAT SHEETS.

	To 18 Ga.	18-20	21-24	25-26	27	28	29	30	32	34
3 to 26" wide—										
24 to 96" long	Base	Base	.01	.02	.03	.04	.05	.06	.07	.08
97 to 120" "	Base	Base	.02	.03	.04	.05	.07	.08	..	..
121 to 156" "	Base	.01	.03	.05	.08	.10	..	..	..	..
26 to 47" wide—										
24 to 96" long	Base	Base	.03	.04	.05	.06	.08	.10	..	..
97 to 120" "	Base	Base	.04	.06	.07	.08	..	..	..	..
121 to 156" "	Base	.01	.05	..	..	..	..	..	..	..
48 to 60" wide—										
24 to 96" long	Base	Base	.06	.10	..	..	..	..	..	..
96 to 120" "	Base	Base	.08	..	..	..	..	..	..	..
121 to 156" "	..	.01	.01	.10	..	..	..	..	..	..
60 to 68" wide—										
24 to 96" long	Base	Base	.05	..	..	..	..	..	..	..
96 to 120" "	..	.01	.01	.08	..	..	..	..	..	..
121 to 156" "	..	.02	.02	..	..	..	..	..	..	..

EXTRAS FOR STRIP ROLLED SHEETS.

	3-13	14	15	16	18	20	21	22	24
12 to 15 Ga., Inc.	Base	Base	Base	Base	Base	.01	.02	.02	.03
16-17	Base	Base	Base	Base	Base	.01	.02	.02	.04
18-20	Base	Base	Base	Base	.01	.02	.03	.04	.05
21-22	Base	Base	Base	.01	.02	.02	.04	.05	.06
23-24	Base	Base	.01	.02	.02	.03	.05	.06	.08
25	Base	Base	.01	.02	.03	.04	..	..	..
26	.01	.01	.02	.03	.04	.05	..	..	..
27	.01	.01	.02	.03	.05	.06	..	..	..
28	.02	.02	.03	.05	.07	..	..	..	..
29	.02	.02	.03	.05	.08	..	..	..	..
30	.03	.03	.04	.06	..	..	..	..	..
32	.04	.04	.06	..	..	..	..	..	..
34	.05	.06	..	..	..	..	..	..	..

EXTRAS FOR SHEARING.

	12 to 20	21 to 26	27 to 30	31 to 34
Less than 3" to 1½" wide	.01	.02	.03	.04
Less than 1½" to ¾" wide	.02	.03	.04	.06
3 to 30" wide—				
12 to 24" long	.02	.03	.04	.07
6 to 12" long	.04	.05	.06	.08
3 to 6" long	.06	.08	.09	.10

Circles 3c. per pound extra.

GRADE "B" NICKEL (GERMAN) SILVER SHEET METAL

Quality.	Net per lb.	Quality.	Net per lb.
5%	42½c.	16%	47c.
8%	43½c.	18%	47½c.
10%	43¾c.	20%	49¼c.
12%	45½c.	25%	57c.
15%	49c.	30%	62½c.

NICKEL (GERMAN) SILVER WIRE

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	15%	52c.
8%	46c.	16%	52½c.
10%	48c.	18%	54½c.
12%	50c.	30%	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are correspondingly higher.

SHEET BLOCK TIN AND BRITANNIA METAL

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—No quotation.

PLATERS METALS

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SHEET SILVER

Rolled silver anodes .999 fine are quoted at —— above the price of bullion. Manufacturers state that as silver is selling at a premium at the present time they are unable to give any quotation.

NICKEL ANODES

85 to 87% purity.....52½c. per lb.

90 to 92% " .....55c. " "

95 to 97% " .....57½c. " "

Supply Prices, May 6, 1918

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg	lb.	.08
Hydrochloric, C. P., 22 deg	lb.	*.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg	lb.	.09¼
Nitric, 42 deg	lb.	.11⅛
Sulphuric, 66 deg	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	.09
Powdered	lb.	.15
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	—
Argols, white, see Cream of Tartar	lb.	.75
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.40
Cyanide	lb.	.65
Sulphate	lb.	.17
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.75
Crocus	lb.	.10
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	—
Yellow Oxide (Litharge)	lb.	.20
Liver of Sulphur, see Potassium Sulphide	lb.	.15
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate, dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.14
Salts, double bbl.	lb.	.12
Niter (Saltpeter), see Potassium Nitrate.		
Paraffin	lb.	.20
Phosphorus—Duty free, according to quality		nominal
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 34-36%	lb.	—
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅛
Rosin	lb.	.08
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	—
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	67.86
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.37
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.10
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.35
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	—
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	*.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	.50
Sulphate	lb.	.12

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	$70.20
14 " 20 " 64/68 "	"	92.50
12 " 20 " 84/92 "	"	83.55
14 " 20 " 84/92 "	"	108.35

Sewed buffs per pound.

Bleached and unbleached	base,	52c.
Colored	"	49c.

FELT WHEELS

White Spanish—

Diameter	Thickness	Price	
6 to 9 inch	1 to 3 inch	$2.60	per lb.
10 to 16 "	1 to 3 "	2.50	" "
6 to 16 "	From ½ inch to less than 1 inch	2.80	" "
Over 16 "	Over 3 inch	2.60	" "
6 to 16 "	Under ½ inch	2.90	" "
Under 6 "	¼ to 3 inch inclusive (Net weight shipped.)	3.25	" "
Under 6 "	Over 3 inch (Net weight shipped.)	3.35	" "

Mexican Wheels—

Diameter	Thickness	Price	
6 to 9 inch	1 to 3 inch	$2.50	per lb.
10 to 16 "	1 to 3 "	2.40	" "
6 to 16 "	From ½ inch to less than 1 inch	2.70	" "
Over 16 "	Over 3 inch	2.50	" "
6 to 16 "	Under ½ inch	2.80	" "
Under 6 "	¼ to 3 inch inclusive. (Net weight shipped.)	3.15	" "
Under 6 "	Over 3 inch (Net weight shipped.)	3.25	" "

*Wholesale price.